American Machinist

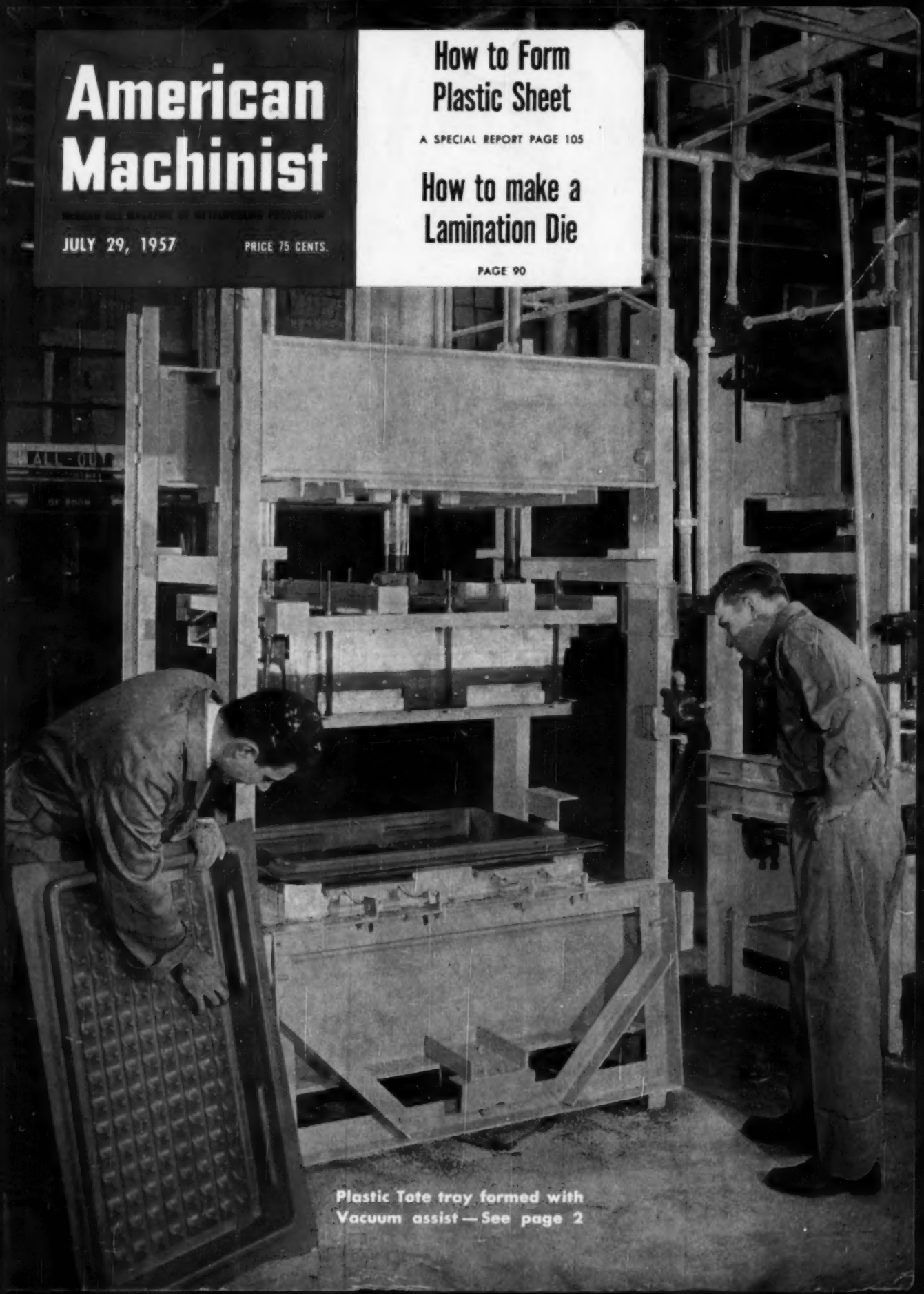
JULY 29, 1957 PRICE 75 CENTS.

How to Form Plastic Sheet

A SPECIAL REPORT PAGE 105

How to make a Lamination Die

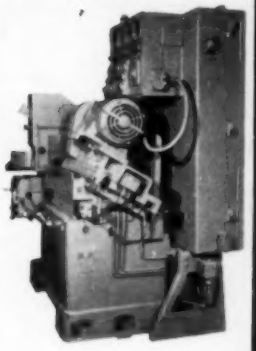
PAGE 90

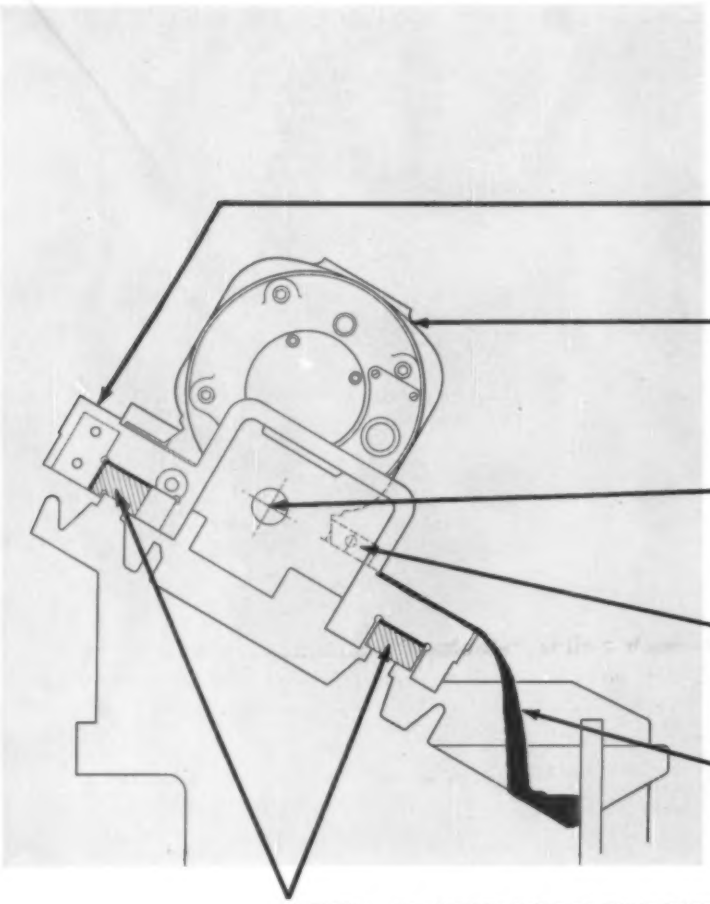


Plastic Tote tray formed with Vacuum assist—See page 2

New RITE-ANGLE CENTRI-MATIC

cuts grinding time as much as 50%





These RITE-ANGLE features mark a major advance in the performance and economy of internal grinding

30° WHEELHEAD TABLE provides maximum strength and rigidity for heavy stock removal — cuts total cycle time in *half* for larger size work.

HIGH PRECISION RED HEAD WHEELHEADS, of either the hi-frequency or belt-driven type, have more than ample capacity for the heavier feeding pressures and faster stock removal used on these RITE-ANGLE machines.

TABLE CYLINDER PISTON ROD is attached to the table close to the center of mass, keeping reciprocating forces in-line with table motion and assuring highest accuracy and precision under all conditions.

INFINITELY VARIABLE HEIGHT ADJUSTMENT OF WHEELHEAD, particularly for taper work, is provided by a tapered gib mounted with the wheelhead on the inclined table.

SWARF AND COOLANT drain directly off the table and into the coolant tank, preventing fouling of the ways or contamination of the hydraulic fluid or coolant.

HARDENED AND GROUND BOX-TYPE TABLE WAYS with large contact area, are built to last a lifetime. Front and top surfaces of upper way form a long, vee-angle guide which assures permanent, high precision table-tracking.

Fully Automatic Machines for Small to Medium Work

The Model 190A and 1901A provide maximum production with highest accuracy and precision for work up to 4½" O.D. Shoe-type centerless workholding tends to bridge any waves present in the O.D., producing perfect concentricity while reducing the possibility or repeating waves in the bore or raceway. Fully automatic cycling, including interlocking loading and unloading, permits one operator to handle a group of machines. Setting up is simple, too, as the hydraulic cycle adjustments are infinitely variable and readily accessible.

IT PAYS TO COME TO HEALD!

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

HEALD

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

NEWS REPORT ..

. . . Spot News . . 73
. . . Washington . . 75
. . . Detroit . . 77
. Machine Tools . . 79
. . What's Ahead . . 83
. . General News . . 130
. . . Field Report . . 136
. . . Names . . 139

Departments...

Letters . . 66
Editorial . . 87
Practical Ideas . . 102
Round Table . . 101
. . . Discussion . . 166
Talking Shop . . 129
New Equipment . . 140

contents for July 29, 1957

VOLUME 101, NUMBER 15

Milling machine becomes tracer lathe to cut nylon . . . A special missile job required a lathe beyond the capacity available, so a miller was converted. *By W P Stephens, Melpar Inc.* **89**

How to make a lamination die . . . The methods and planning used to build a press tool in England. *By Alfred N Appleby, British Thomson Houston Co, Ltd.* **90**

Ingenious mandrel solves welding problems . . . Collapsible device locates parts and serves as chill bar. *By Chester Szymko, Argonne National Laboratory* **93**

Ways to discipline employees . . . Here are the 14 most common problems in discipline and some suggestions on how to deal with them. *By Ernest W Fair* **94**

"Meccano" approach builds "elephant" machines . . . A building-block plan for a machine tool that will do almost any kind of machining operation. **96**

Inverted air chamber controls fluid level . . . A simple trick to control the fluid level in a tank. *By E E Rubac, American Iron & Machine Co.* . . . **100**

SPECIAL REPORT NO. 447

How to thermoform plastic sheet . . . Here is a summary of the ways to sheet form plastic with advice on when to use these methods in preference to molding. *By E F Bachner, Chicago Molded Products Corp.* **105**

REFERENCE BOOK SHEETS

Diamond-wheel shapes III, IV . . . New system standardizes the diversity of wheel shapes that have outmoded the old system. **123**

JIC press room standards . . . Tooling dimensions of open-back stationary presses of single-crank type, as standardized by the Joint Industry Committee. **127**

American Machinist *Chips*

Cover...
Sheet forming press designed and built by Bassons Industries Corp. Details of the operation are at left and in the Special Report on page 105.

Plastic Sheet... When do you make plastic parts by forming them from plastic sheet rather than by injection or compression molding? And if you do form them, what plastic can you use and what forming method should you select? To answer these questions, our current Special Report goes into the subject exhaustively. You'll find the methods of sheet forming described along with the types of equipment and the mold construction required. Case studies of molded parts round out this valuable summary.

An example of a formed part is shown on our cover. It is a tote pan for IBM typewriter rolls formed from ¼-in. copolymer plastic sheet. The press has a 100-ton hydraulic cylinder at the top (only 25 tons required for this part) and an air cylinder at the base to actuate the swivel frame for side cores. The mold is designed for plug and ring undercut forming with vacuum assist. The mold frame is built of mahogany and Masonite, the impressions and side cores are made from an aluminum-filled epoxy.

Where do you find ideas?... We recall with some affection the charge made last winter that engineers in the auto industry are guilty of "intellectual incest." By talking too much to each other they were said to be missing the cross-pollination of ideas from other industries. We bring this up again because too often production men tend to miss the good idea that has its origin in a company that seems to be in an unrelated business.

A good example of the problem is the article, "Inverted air chamber controls fluid level" on page 100. This article came straight from the oil fields and the original title was, "How to coat threads on unwieldy drill collars." It is still the same article, but the emphasis has been shifted from the particular local problem that brought forth the idea to the idea itself. The result is an article describing a widely useful method to control fluid level in a tank. We may not always be this successful in highlighting the basic ideas in the articles we publish, but you can get maximum usefulness from your reading of *American Machinist* by looking at the basic ideas and principles presented and relating them to *your* specific problems.

Coming... *AM* for August 12 will feature a Special Report on hardness testing. There will be articles on machining slits by electrical discharge in metals such as uranium, the next in our management series, a cam "catalog" that slashes cost of screw-machine production, a semi-automatic production line that provides flexibility, and a building-block concept applied to tracer-controlled milling machines. Plus all the usual departments.

ALBERT HAUPTLI publisher

BURNHAM FINNEY editor

ANDERSON ASHBURN managing editor
RUPERT LE GRAND senior associate editor

BEN BROSHEER (Chicago) associate editor
H E LINSLEY associate editor
CHARLES D EMERSON associate editor
WM M STOCKER, JR associate editor
JOHN P WRIGHT associate editor
GEORGE H DE GROAT Detroit editor

ANN McTAGUE assistant editor
TOM JOHNSON assistant editor
GOSTA WERNBERG assistant editor
RICHARD T BERG assistant editor
JOHN J DWYER, JR assistant editor

RICHARD E ROOMAN art director
JOSEPH S POZNANSKI assistant
ANNE PALMER assistant
MATTHEW T HAGGERTY assistant

ROBERT SHEETS news editor
HARRY HOMEWOOD Detroit
WILLIAM G MELDRUM Cleveland
MARGARET RALSTON San Francisco
JOHN SHINN Los Angeles
MICHAEL J MURPHY Los Angeles
CHARLES T DIXON, JR Atlanta
KEMP ANDERSON, JR Dallas
WILLIAM J COUGHLIN London
ROBERT E FARRELL Paris
PETER WEAVER Rio de Janeiro
MORRIE HELITZER Bonn
DAN KURZMAN Tokyo
JOHN H KEARNEY Mexico City
DOUGLAS GREENWALD statistician
M K MATULIS assistant statistician

DEXTER KEEZER director economics dept
GEORGE B BRYANT, JR chief Washington bureau
JOHN WILHELM editor world news
FRED H COLVIN editor emeritus

GEORGE REPPERT, JR advertising sales manager
RUSSELL T DOUGLAS business manager
ROBERT C MATTOON circulation manager
CATHERINE C KANE manager, reader service

American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index. American Machinist publishes its own annual index; this is available on request to the editor.

American Machinist, published bi-weekly, with an additional issue in mid-September, by McGraw-Hill Publishing Company, Inc. James H McGraw (1860-1948), Founder.

EXECUTIVE, EDITORIAL, CIRCULATION, ADVERTISING and PUBLISHING OFFICES: McGraw-Hill Building, 330 West 42nd St, New York 36, NY. Donald C. McGraw, President; L. Keith Goodrich, Vice President and Treasurer; John J. Cooke, Secretary; Nelson Bond, Executive Vice President, Publications Division; Ralph B Smith, Vice President and Editorial Director; Joseph H Allen, Vice President and Director of Advertising Sales; A R Venezian, Vice President and Circulation Coordinator.

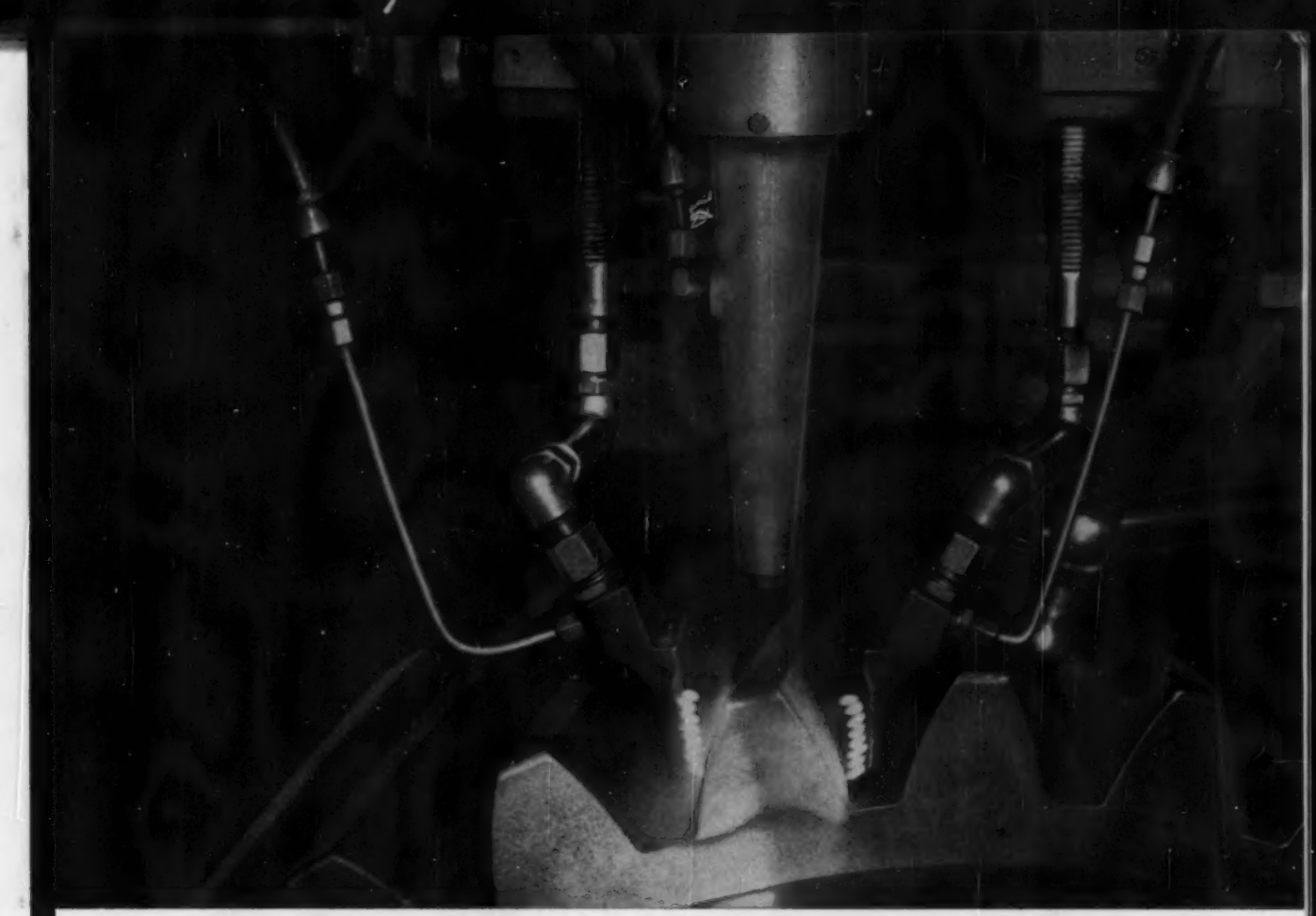
Subscriptions are solicited only from production executives and engineers in the metalworking industries. **Position and company connection must be indicated on subscription orders.**

Postmaster: Please send form 3579 to American Machinist, 330 West 42nd St, New York 36, NY

United States subscription rate for individuals in the field of the publication $5.00 per year, single copies 75 cents, foreign $25.00 per year, payable in advance. Second-class mail privileges authorized at New York, NY. Printed in USA. Title registered in U S Patent Office.

© Copyrighted 1957 McGraw-Hill Publishing Co, Inc, all rights reserved.

SUBSCRIPTIONS: Send subscription correspondence and change of address to Subscription Manager, American Machinist, 330 West 42nd St, New York 36, NY. Subscribers should notify Subscription Manager promptly of any change of address, giving old as well as new address, and including postal zone number, if any. If possible, enclose an address label from a recent issue of the magazine. Please allow one month for change to become effective.



It uniformly controls
surface hardening of gear teeth

You can step up the wear resistance of gear teeth greatly with Gleason Surface Hardeners. They provide localized hardening *without distortion* because of uniform temperature control.

Key to this performance is the radiation pyrometer and electronic controls. That vertical gun-like barrel in the center of the photo above is the radiation pyrometer. It is focusing directly on the tooth being hardened. As the oxyacetylene burners heat the tooth, the thermopile receives radiant energy from the heated metal. An electronic balancing device converts that energy to control forces which govern the travel of the burners along the tooth.

This makes surface hardening of gear teeth an exact operation. There is no measurable distortion because only the gear teeth are heated and each tooth is heated uniformly on both sides. The region of hardness is limited to the wearing surfaces, thus greatly increasing gear life.

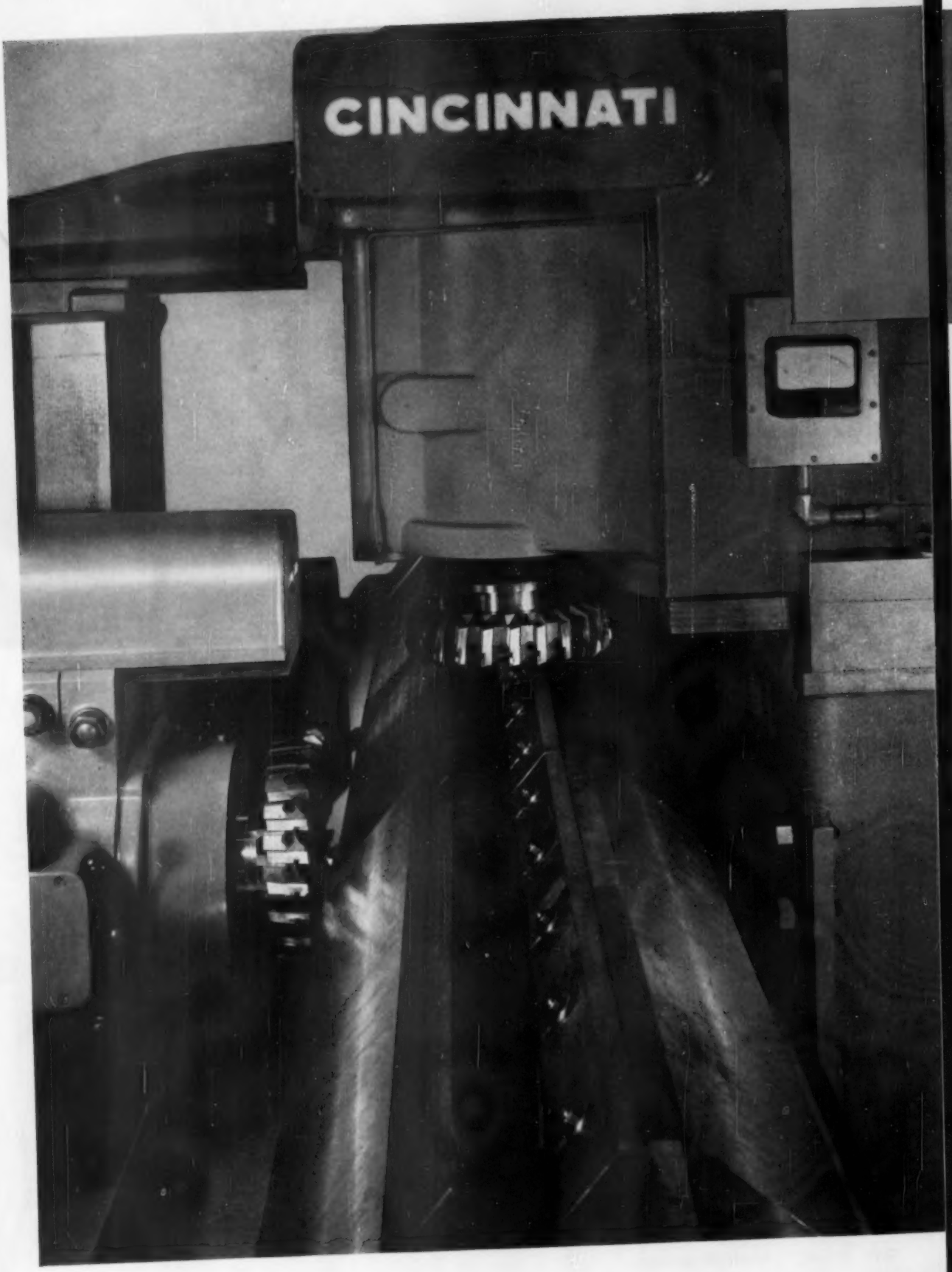
Gleason Surface Hardeners assure absolute uniformity of all teeth on a gear and every gear in a lot. They are adaptable to hardening straight bevel, spiral bevel, Zerol, spur, herringbone and helical gears. For additional information, write for the booklet "The Surface Hardening of Gear Teeth."

No. 1 Gleason Gear Surface Hardener with electronic control unit. Accommodates bevel gears up to 24" pitch diameter, spur and helical gears up to 30", internal gears up to 24" outside diameter.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.


CINCINNATI

HyPowermatic

with Two 50 hp Spindles

Mills Several Surfaces of Long Steel Parts

Unusual requirements are commonplace conditions for Cincinnati's Special Machine Tool Division. A manufacturer of a variety of long steel knives, blades and similar parts wanted a machine having the versatility to mill the entire range of these parts, and in addition, rapid rates of metal removal were required. Cincinnati Engineering Service Specialists, using the extensive standard HyPowermatic® line as a basis, developed the special HyPowermatic Milling Machine illustrated here. Excellence of performance may be judged from the following specification highlights:

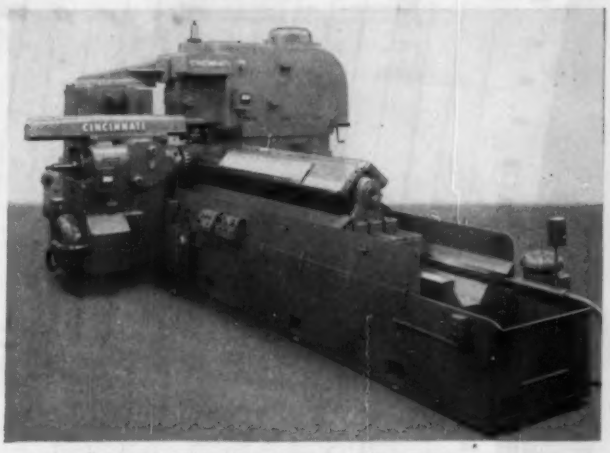
50 hp motor drive for each spindle . . . table feeds ¼ to 100 ipm . . . spindle speeds 20 to 800 rpm . . . rapid table traverse 200 ipm . . . 168" table travel . . . automatic quill retraction . . . high pressure flushing system for continuous removal of chips

For all milling operations, the work is held on a universal magnetic chuck, energized prior to the table traverse, and equipped with power angular positioning. This machine is typical of single units of production equipment built by the Special Machine Tool Division. Other types of equipment range up to complete production lines. May we show you what we can do to solve your metal-working production problems and their related handling chores? Our Engineering Service team wants to hear from you.

Special Machine Tool Division

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

Straddle milling operations, too! The setup illustrated above shows how it's done.



CINCINNATI® Special 100 hp HyPowermatic Milling Machine removes metal in a torrent or a light flurry, as required by the part being milled.

CINCINNATI

MILLING MACHINES • BROACHING MACHINES • CUTTER AND TOOL GRINDERS • METAL FORMING MACHINES
HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID • GRINDING WHEELS

THIS RED LINE

"IN

Fellows Red Liner: Automatically makes and records a composite check of all gear errors in combination. Three capacities.

THE
PRECISION
LINE

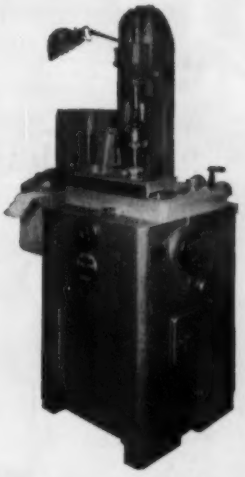
helps to keep production THE BLACK"!

The red line on a chart from a Fellows Gear Inspection Instrument gives accurate, large-scale indication of gear errors and their nature . . . keeps production costs down by minimizing rejects. And the permanent chart gives recorded *proof* that gears meet specifications in every respect.

Whether you're manufacturing tiny, fine-pitch gears or large, coarse-pitch ones, for your own products or for customers, it pays to rely on Fellows inspection instruments. For full information, get in touch with your Fellows Representative. Write, wire, or phone any Fellows office.

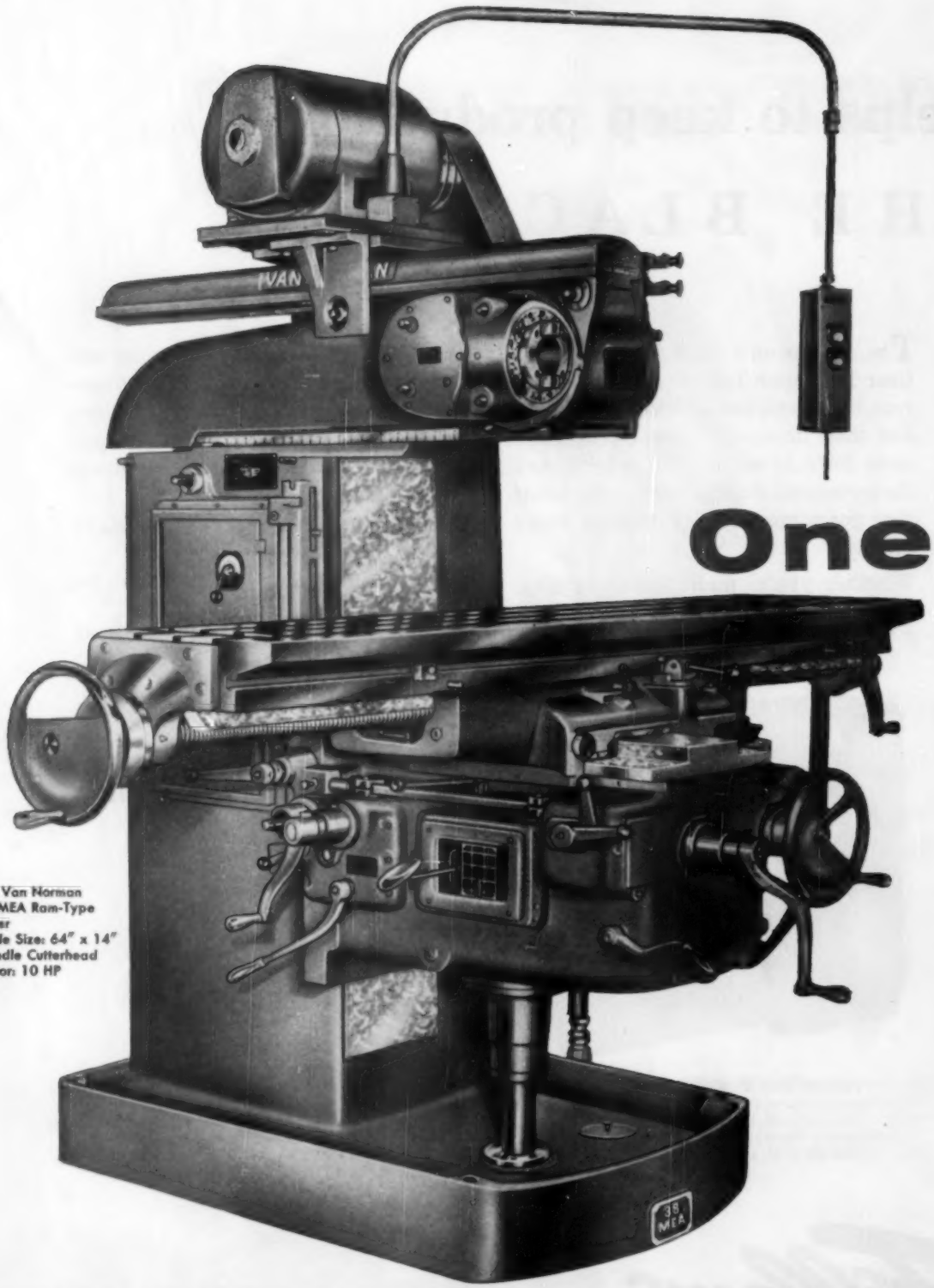
THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices:
1048 North Woodward Ave., Royal Oak, Mich.
150 West Pleasant Ave., Maywood, N.J.
5835 West North Avenue, Chicago 39
6214 West Manchester Ave., Los Angeles 45

Fellows Lead Measuring Instrument: measures and electrically records the accuracy of helical and other surfaces; checks crown and taper. 12" and 24" P.D. capacities.



Fellows Involute Measuring Instrument: rapidly and easily checks involute profiles of external and internal spur and helical gears and records results. 12" and 24" P.D. capacities.

Fellows *Gear Production Equipment*



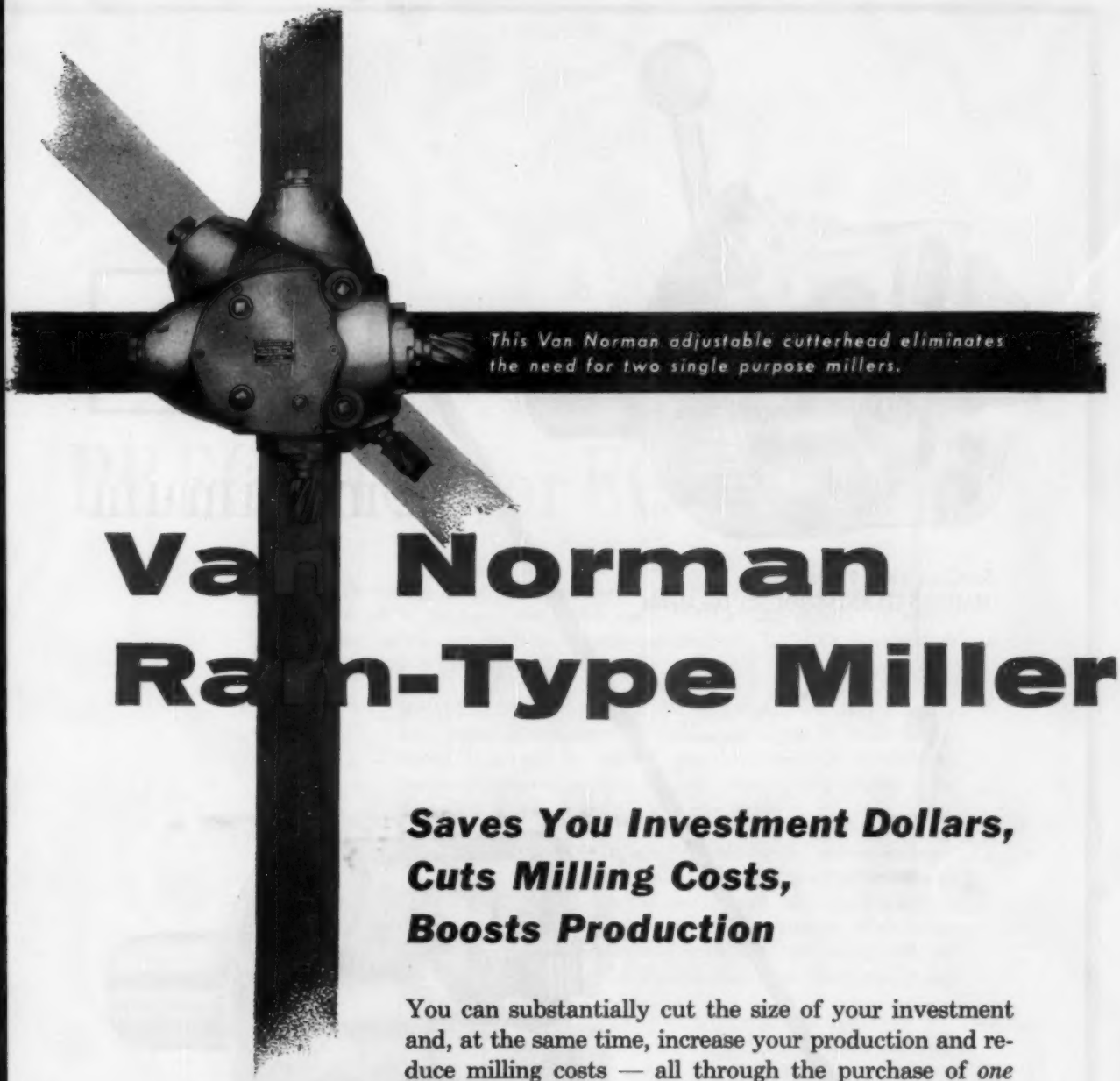
One

The Van Norman
38 MEA Ram-Type
Miller
Table Size: 64" x 14"
Spindle Cutterhead
Motor: 10 HP

VAN NORMAN MACHINE

A DIVISION OF VAN NORMAN INDUSTRIES, INC.

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.



This Van Norman adjustable cutterhead eliminates the need for two single purpose millers.

Van Norman Ram-Type Miller

Saves You Investment Dollars, Cuts Milling Costs, Boosts Production

You can substantially cut the size of your investment and, at the same time, increase your production and reduce milling costs — all through the purchase of *one* Van Norman Ram-Type Miller.

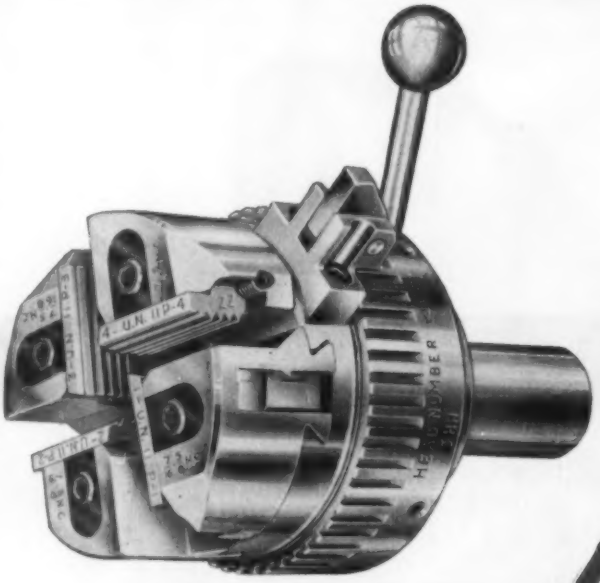
Available for all types of work, Van Norman Ram-Type Millers permit horizontal, vertical and angular milling without attachment — they reduce idle machine and operator time.

Get complete details on the Van Norman 38 MEA, or on any of the many Van Norman Ram-Type Millers. Write, wire or telephone for catalog.

COMPANY

SPRINGFIELD 7, MASSACHUSETTS

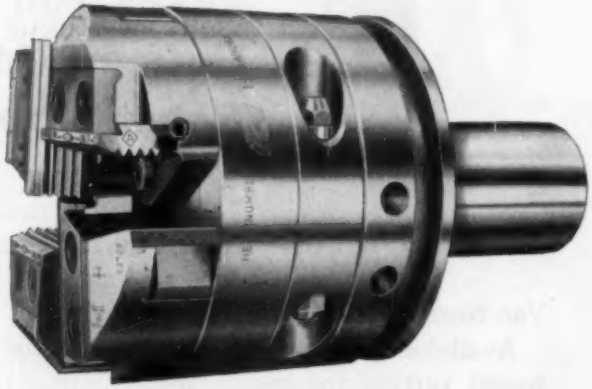
Don't wait . . . for extra profit install a Van Norman machine now! They are available in many purchase plans . . . Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate up to 10 years. Conditional Sales Contracts not available to Export.



for Class 4 and 7 tolerances
HARDENED-AND-GROUND Die Heads

2

..... maximum



for Class 2 and 3 tolerances
HEAT-TREATED Die Heads

LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA • U. S. A.

445-C

styles of LANDIS Die Heads
PRECISION or ECONOMY

"Threading Efficiency" requires the selection of the proper die head for the job to be done, and is the essence of LANDIS design. To ensure that you may use the most efficient threading tool, LANDIS manufactures Die Heads in two basic styles:

HARDENED-AND-GROUND HEADS should be used where a high degree of thread-cutting accuracy is required. Their fundamental design and the inherent qualities of specially selected and hardened materials provide the maximum rigidity necessary for threading to Class 4 and Class 7 tolerances.

HEAT-TREATED HEADS are designed for the utmost economy when doing commercial threading, and will produce threads to Class 2 and 3 fits. The initial cost is small and rugged construction ensures trouble-free operation and few repairs. Wide range coverage requires minimum tool inventories, and along with the use of LANDIS Tangential Chasers allows maximum output per dollar of tool cost.

LANDIS Tangential Chasers are an important factor both in the economy and precision of these basic head styles. These chasers may be replaced or reground singly, will thread all diameters of the same pitch and form, and can be used for 80% of their original length. Their basic design minimizes stress and distortion, and allows either style of die head to produce threads of the accuracy for which it is recommended.

LANDIS manufactures more than 100 sizes and styles of standard and special Die Heads for use on threading machines, turret lathes, tapping machines and bar automatics. Let us suggest the Head most suitable for *your* needs—send specifications and ask for Bulletins F-80 and F-90.

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT • CUTTING • TAPPING • GRINDING • ROLLING

Exclusive features make Landis universal grinders a "best buy"

Here's where they will save time... reduce grinding costs:

Tool Rooms
Jobbing Machine Shops
Maintenance Shops
Tool and Die Shops
Training Shops
For short production runs
For small precision parts

Landis 10" x 20" Type H Precision Universal Grinder

LANDIS
precision grinders

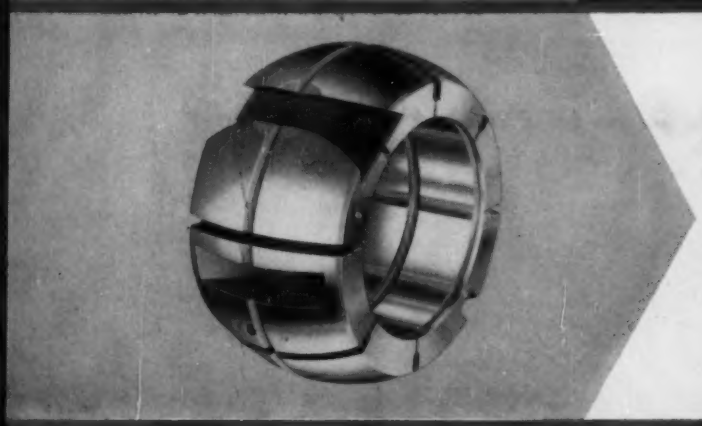
LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

Fully universal wheelhead for fast setup

Easy hand swiveling with exclusive Landis wheelhead swivel mechanism.

Swinging internal grinding fixture for fast *change* of setup

Quickly lowers for internal grinding; locks securely and rigidly; swings up out of the way; no exposed belts.



Microsphere bearings for close tolerances and fine finishes

Closest running clearance of any spindle bearing; gives sensitive response to wheel feed, quick sparkout, dependable operation.

Fully universal headstock for ease of operation

Compact, low design; only two revolving parts. Variable speed control by rheostat. Swivels for angle or face grinding.

GIDDINGS & LEWIS

(MODEL 300-T)

precision horizontal boring, drilling and milling machine

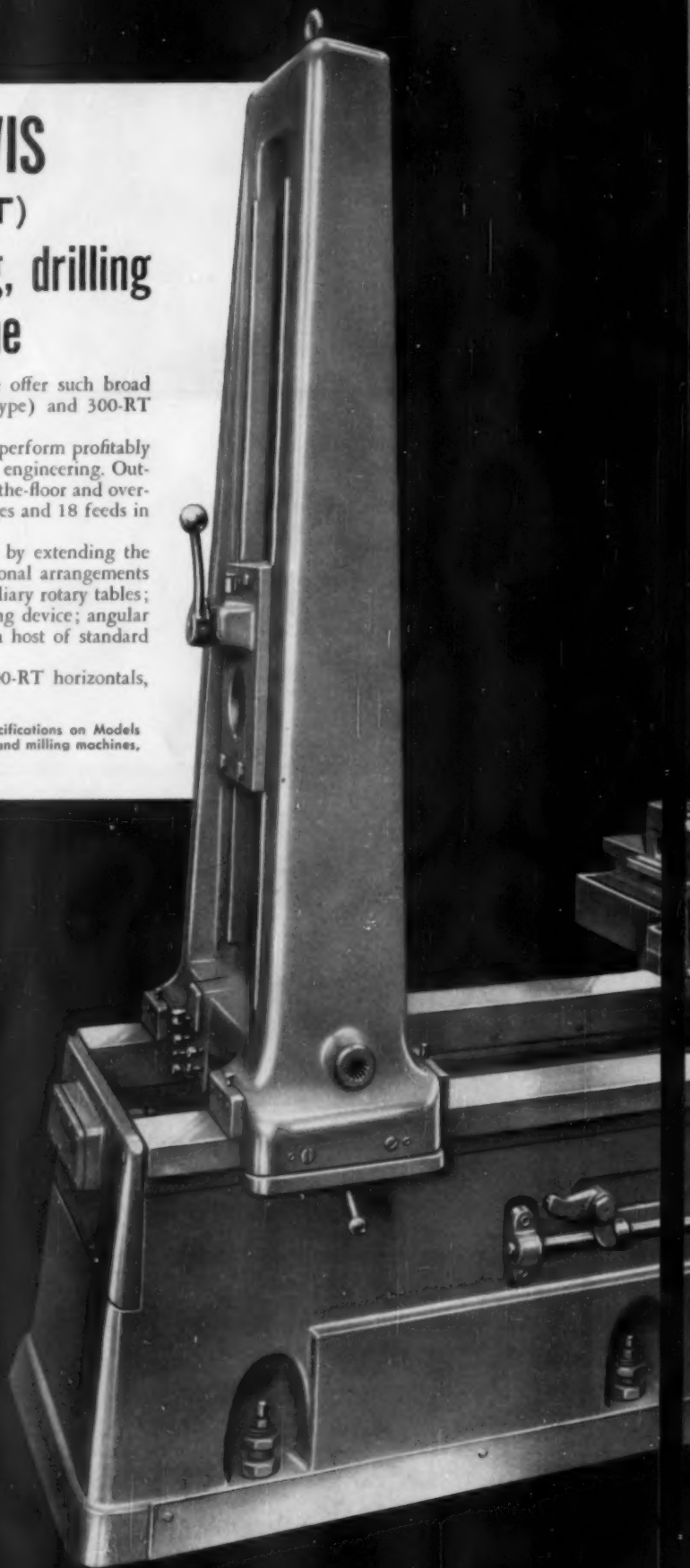
No other horizontal bars of comparable size and type offer such broad machining possibilities as G&L Models 300-T (table-type) and 300-RT (revolving table-type) with 3" diameter spindle.

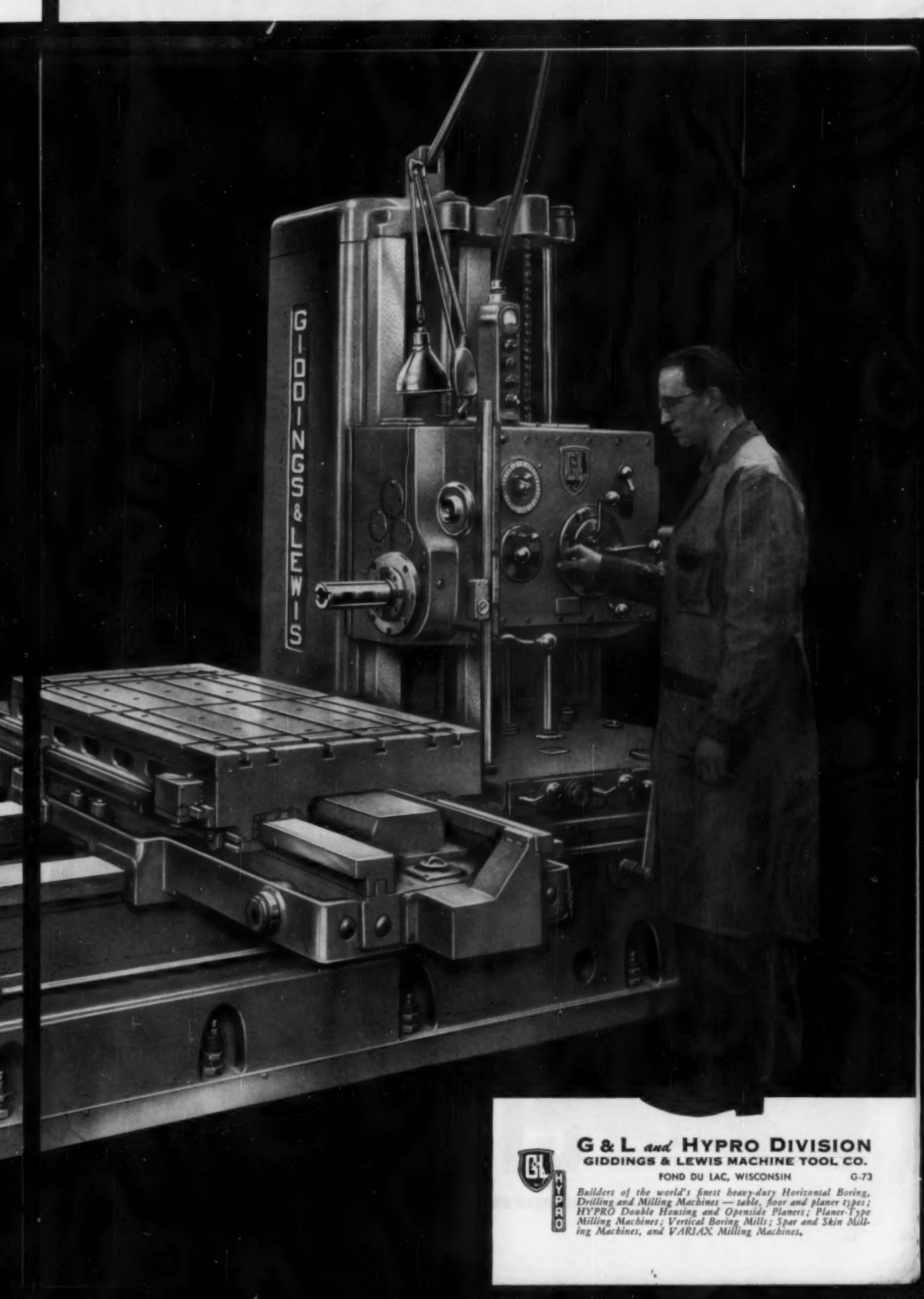
These versatile boring, drilling and milling machines perform profitably without loss of down time because of G&L's progressive engineering. Outstanding design features include rigid saddle support, in-the-floor and over-the-floor auxiliary runways, 45 optional speeds in 5 ranges and 18 feeds in any range — augmented by a total of 23 milling feeds.

Profitable production capacities are further increased by extending the machine's normal working range with a variety of optional arrangements and attachments: quick change spindle (optional); auxiliary rotary tables; automatic electric positioning device; improved measuring device; angular milling attachments; continuous feed facing head and a host of standard Davis boring bars and cutters.

For more information on the Models 300-T and 300-RT horizontals, see your nearest G&L representative or write direct.

LITERATURE AVAILABLE: For complete specifications on Models 300-T and 300-RT horizontal boring, drilling and milling machines, write for Bulletin No. 300-T.





G & L *and* HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN G-73

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines, and VARIAX Milling Machines.

There's more *drive*

Highest quality of sizing and roundness is obtained at low cost by grinding these anti-friction bearing rings on a CINCINNATI FILMATIC No. 4 Centerless Grinder equipped with Power Race Grinding Fixture.

(Photo courtesy of McGill Manufacturing Company, Inc., Valparaiso, Indiana)

CINCINNATI

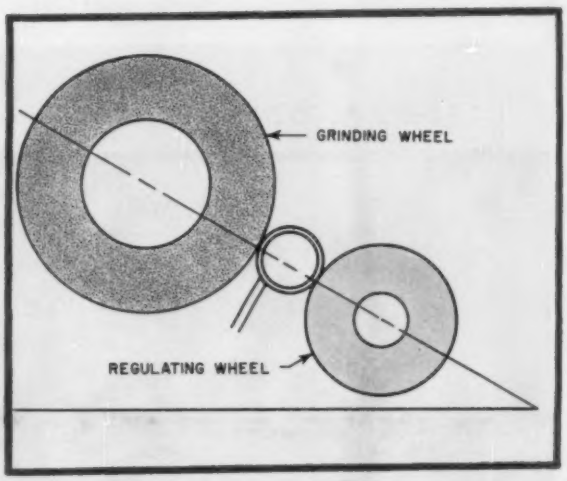
CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE

in the Cincinnati No. 4

... a Plus Factor in Centerless Grinding Large Parts

FILMATIC

A prominent manufacturer of precision anti-friction bearings grinds large diameter rings on a CINCINNATI ®FILMATIC No. 4 Centerless. And there's a good reason for choosing the No 4. The bed is inclined at a 30° angle, resulting in an increased driving effort by the regulating wheel. Even with no grinding wheel contact, the work rotates with the regulating wheel. ¶ Other advantages of CINCINNATI FILMATIC No. 4 Centerless Grinders include: self-adjusting grinding wheel spindle bearings (they're FILMATIC, of course) . . . hydraulic grinding wheel truing . . . independent 400 rpm truing speed for regulating wheel . . . no collets required for regulating wheel . . . 30 hp main drive. ¶ Only Cincinnati can offer a choice of six sizes of fine centerless grinding machines. You will find brief specifications for all of them in Sweet's Machine Tool Catalog File.



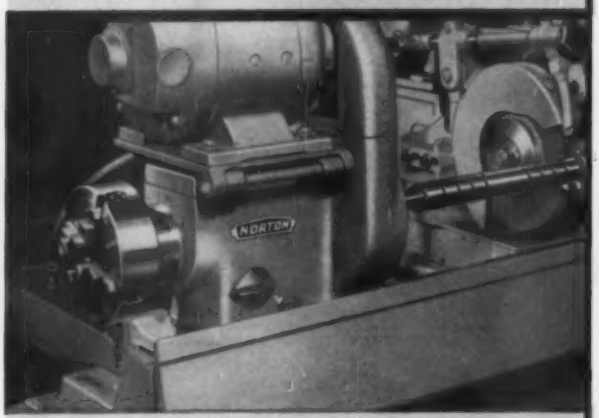
CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

CINCINNATI FILMATIC NO. 4 CENTERLESS GRINDING MACHINE
Write For Catalog No. G-538-3

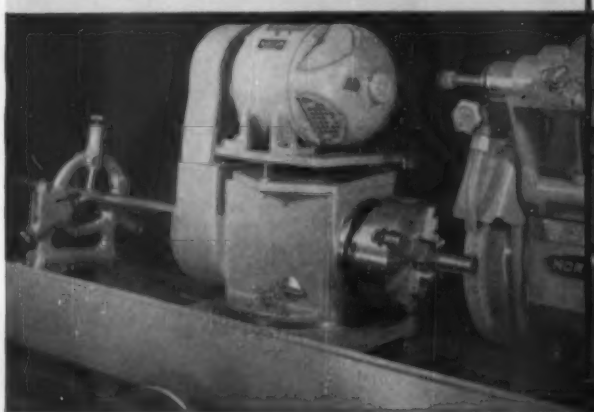
GRINDING MACHINES • CHUCKING GRINDERS • MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Norton builds extra versatility into universal grinders...

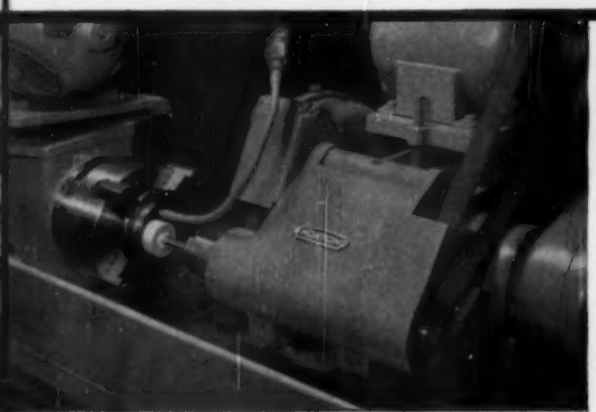
JOB-SPEEDING FEATURES



Minimum effort to change from dead center to chucking work. Chuck may remain mounted at back end of headstock while dead-center grinding.

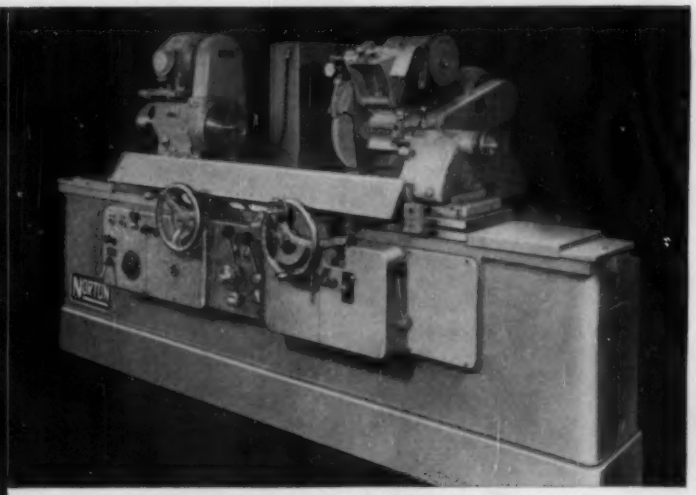


Hollow headstock spindle gives you additional capacity for grinding long bars by passing them clear through and supporting them in grinding position.



Hinged-bracket type internal grinding spindle swings up and out of the way when not in use. This means quicker setups for your I.D. or O.D. grinding.

Norton 10″ universal grinder. Made with 20″ or 24″ nominal lengths between centers. Catalog 170.



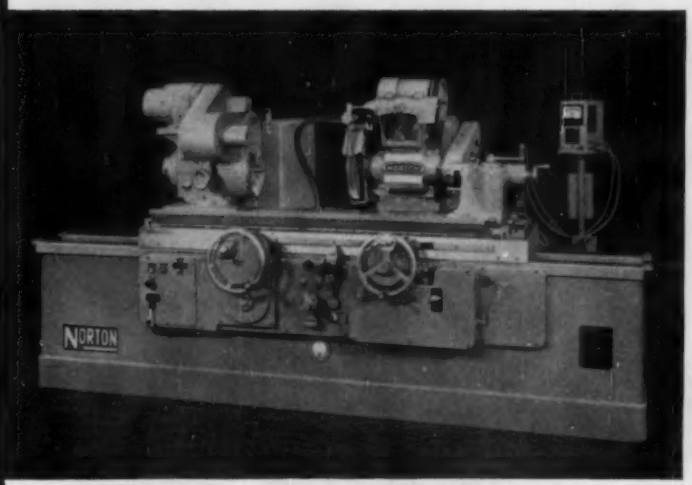
Norton 12″ Type U-4 universal grinder. Made with 36″ or 48″ nominal lengths between centers. Catalog 231.

Many a user rates his Norton universal grinder as a practically "complete grinding department." Why? Because Norton builds extra versatility into its universals for faster external, internal, face, taper and angular wheelside grinding, including many special jobs. Also they're built with many famous job-speeding, cost-cutting features: For example:

Extremely rapid chucking . . . quick change-over to live or dead spindle operation . . . easy work speed changes . . . independent wheel settings that do difficult jobs fast . . . extra capacities on wheel head and headstock . . . precise swivel table alignment with the SWIVALIGN *Dual Electric Indicator, an optional extra.*

Made In The Size You Need

Norton universal grinders are made in 10″, 12″, 14″ and 18″ swing capacities. That means you can get exactly the size to bring you many time-and-money-saving "Touch of Gold" advantages. For complete facts on these high-efficiency machines see your Norton representative or write us direct. And remember: Only Norton offers you such long experience in both grinding machines and grinding wheels to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.



Norton 14″ Type U-4 universal grinder. Made with 36″, 48″ or 72″ nominal lengths between centers and also in 18″ swing capacity. SWIVALIGN* Dual Electric Indicator, at right of picture, measures swivel table adjustments and is optional on all Norton universal grinders. Catalog 819.

To Economize, Modernize with NEW

NORTON

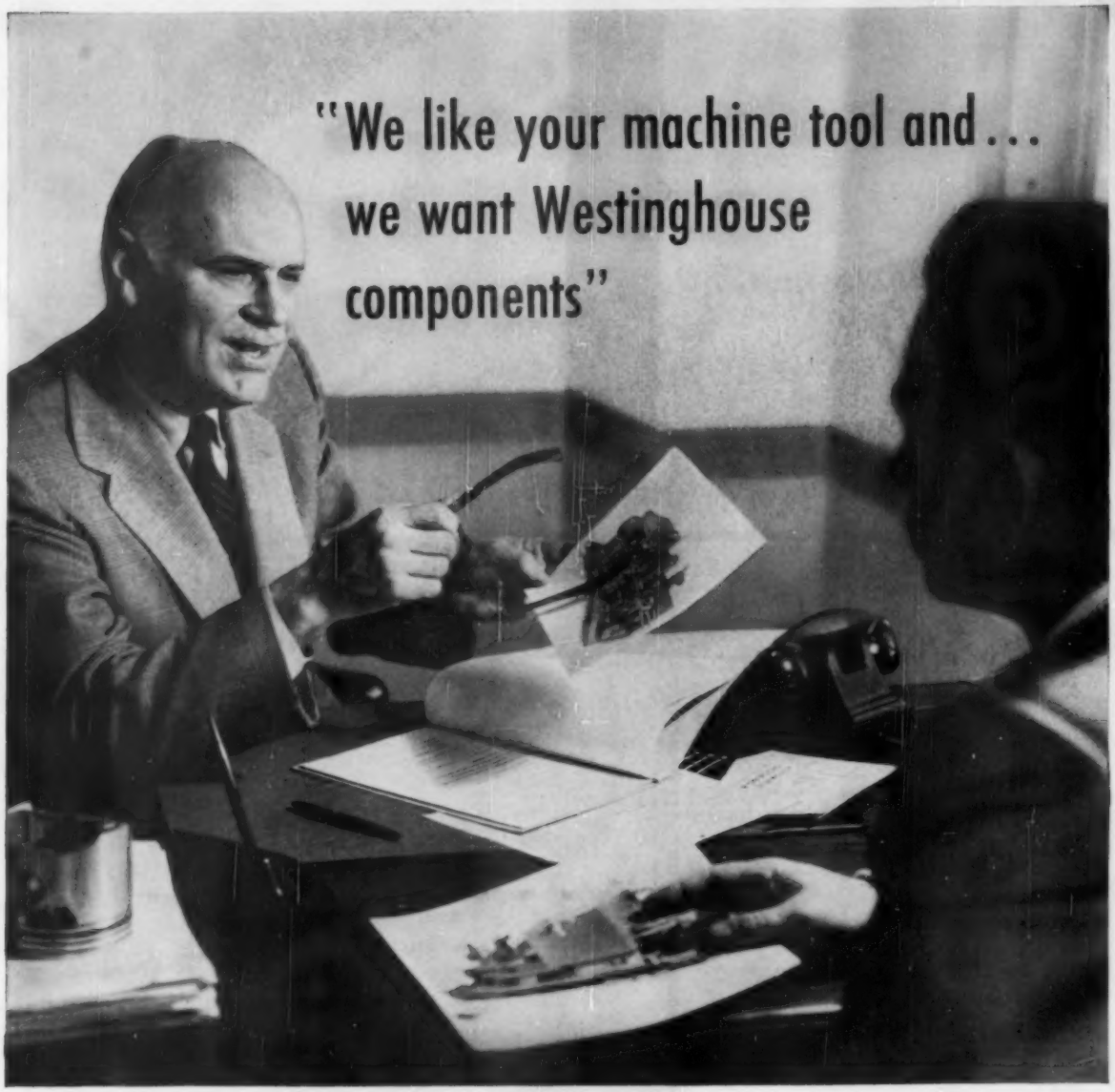
GRINDERS and LAPPERS

Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones • Behr-cut Tapes

District Offices: Worcester • Hartford • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries



A sound decision . . . because getting the most for your machine-tool dollar requires dependable components.

That's why it's good practice to always specify Westinghouse components for your machine tools. They're the result of extensive engineering experience and continuing research aimed at developing units that best serve your equipment.

Westinghouse machine-tool experience in the design, application and servicing of components covers four decades. When you choose Westinghouse . . . you can be *sure.* J-96106

Specify these Westinghouse components when you buy machine tools:

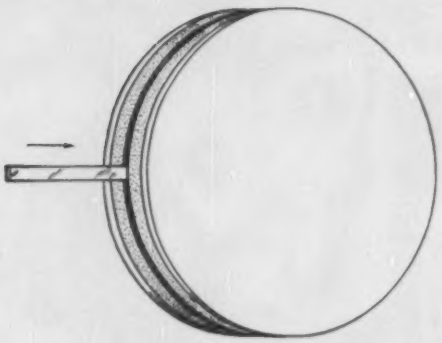
Motors • Controls • Pushbuttons • Gearmotors • Speed Reducers • Adjustable-Speed Drives • Semiconductors • Cypak* Static Control • Rectifiers • Magamp* Magnetic Amplifiers • Instruments • Relays • Machine-Tool Transformers • DYNAC® Magnetic Braking.

*Trade-Mark

YOU CAN BE SURE... IF IT'S Westinghouse

Change to Gardner discs increases metal removal by 40%

...gives longer disc life and lowers grinding costs



Workpiece:.....Bar stock—¼" to 1¼", 3' to 19' long.

Operation:.....Grind parallel sides.

Stock Removal:..Former discs—average of 179 lbs. of stock removed per set of discs.

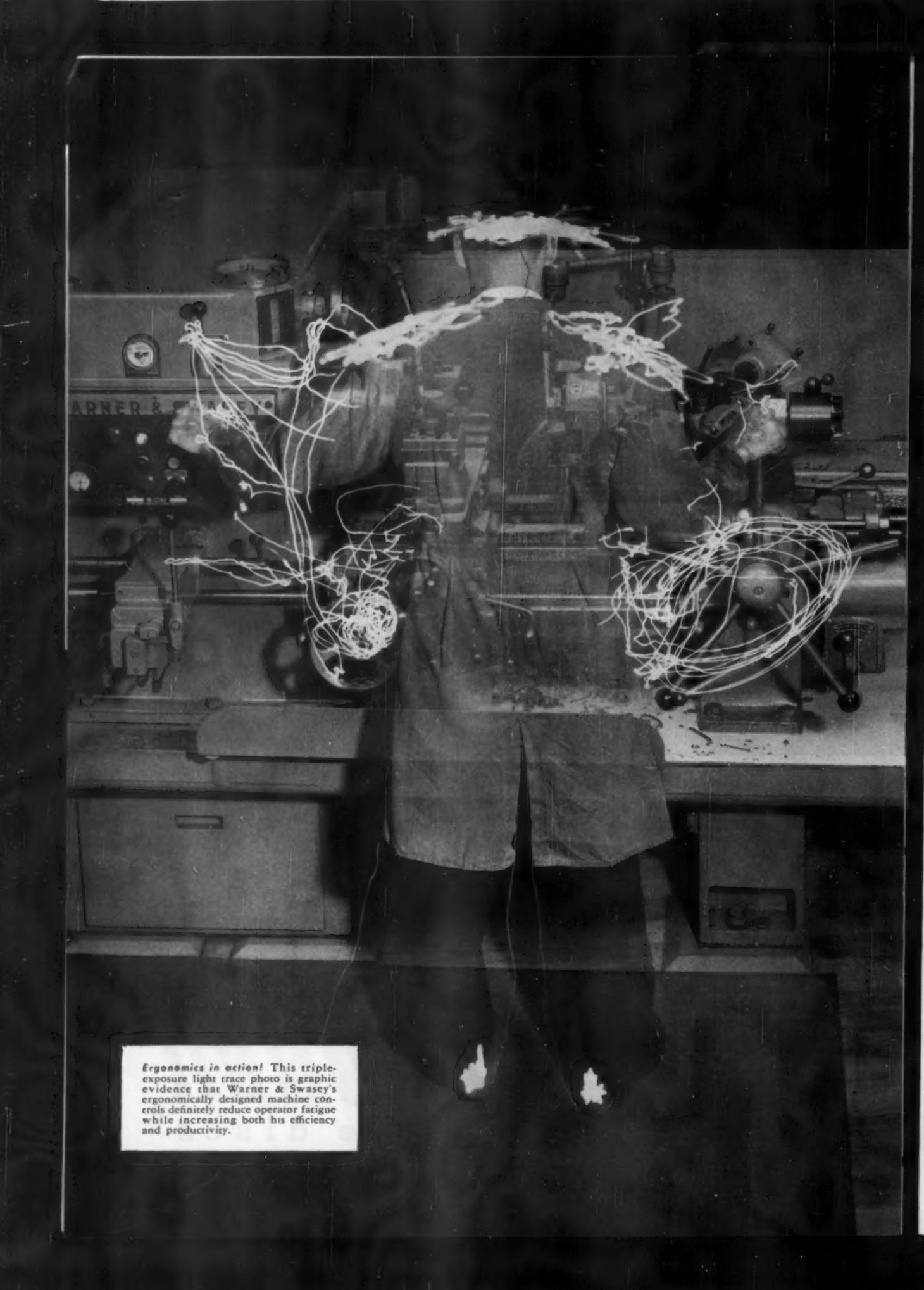
GARDNER discs—average of 250 lbs. of stock removed per set of discs.

The tangible benefits of more efficient disc grinding can also be applied to your particular production. Call your Gardner Abrasives Man for demonstration.

GARDNER

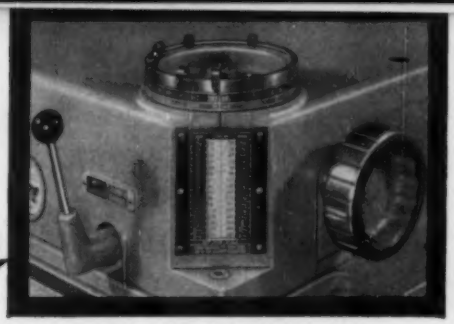
abrasive discs

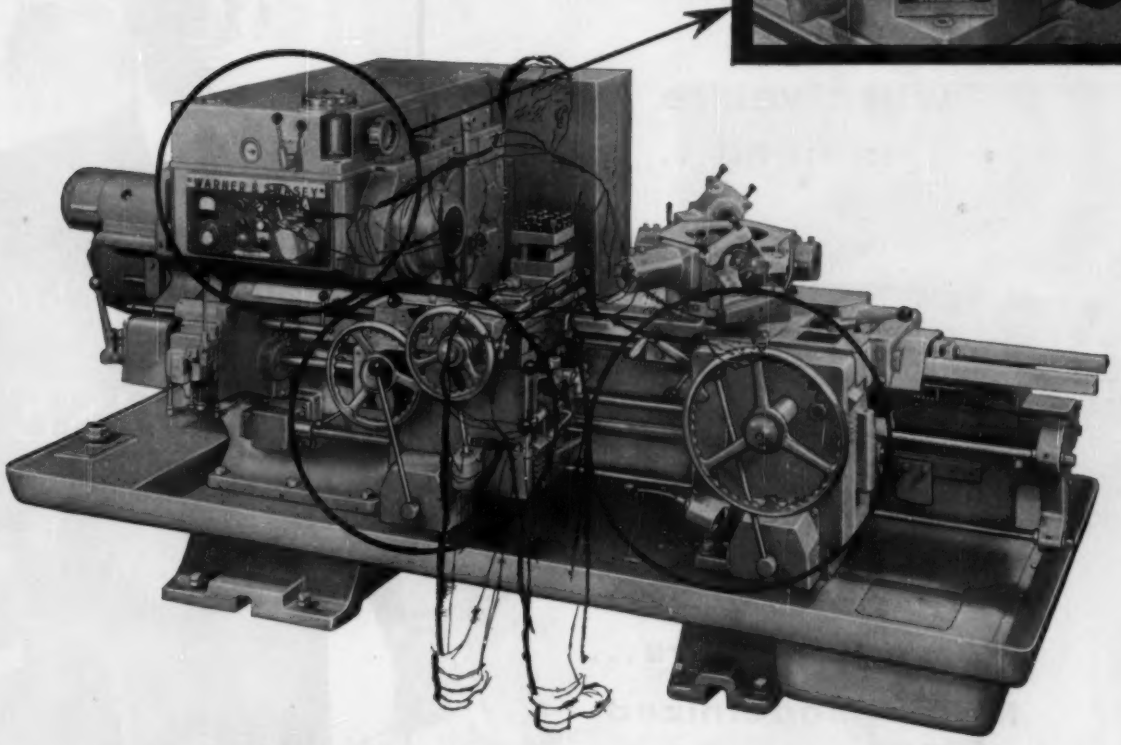
BELOIT, WISCONSIN



Ergonomics in action! This triple-exposure light trace photo is graphic evidence that Warner & Swasey's ergonomically designed machine controls definitely reduce operator fatigue while increasing both his efficiency and productivity.

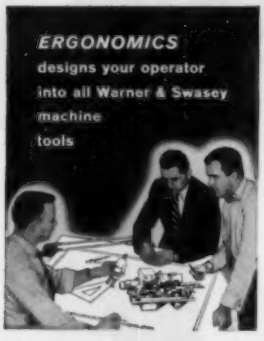
This exclusive Warner & Swasey Speed Preselector, heart of the "zoned controls" system, enables the operator to preselect the correct speed for each cut, with just a glance-and-a-twist of the knurled knob. Proper speeds are chosen for the required cuts on the job and then marked in sequence with numbered clips placed on the top of the chart drum. Just a touch of the lever instantly shifts the machine to the next desired speed.





Warner & Swasey "ZONED CONTROLS"

boost production by helping increase operator efficiency



Known throughout industry as "the operator's machine", Warner & Swasey turret lathes are painstakingly designed with the human element in mind. They provide easy-to-handle operating controls, compactly arranged at convenient levels that minimize stooping and reaching — all of which contribute to increased operator satisfaction and higher production. Heart of the "zoned controls" system is Warner & Swasey's exclusive Speed Preselector — calibrated in surface feet and spindle RPM's versus work diameters — that encourages operator use of the proper spindle speeds for the particular job being machined. Additional single lever control features praised by operators include: A fast, simple change for spindle speeds; apron feed levers with "feel" control; four-way carriage rapid traverse; easy operating turret units and hydraulic collet chuck and bar feed control. For more detailed information about the adaptability of Warner & Swasey turret lathes to your particular machining problems, call in our Field Representative, today.

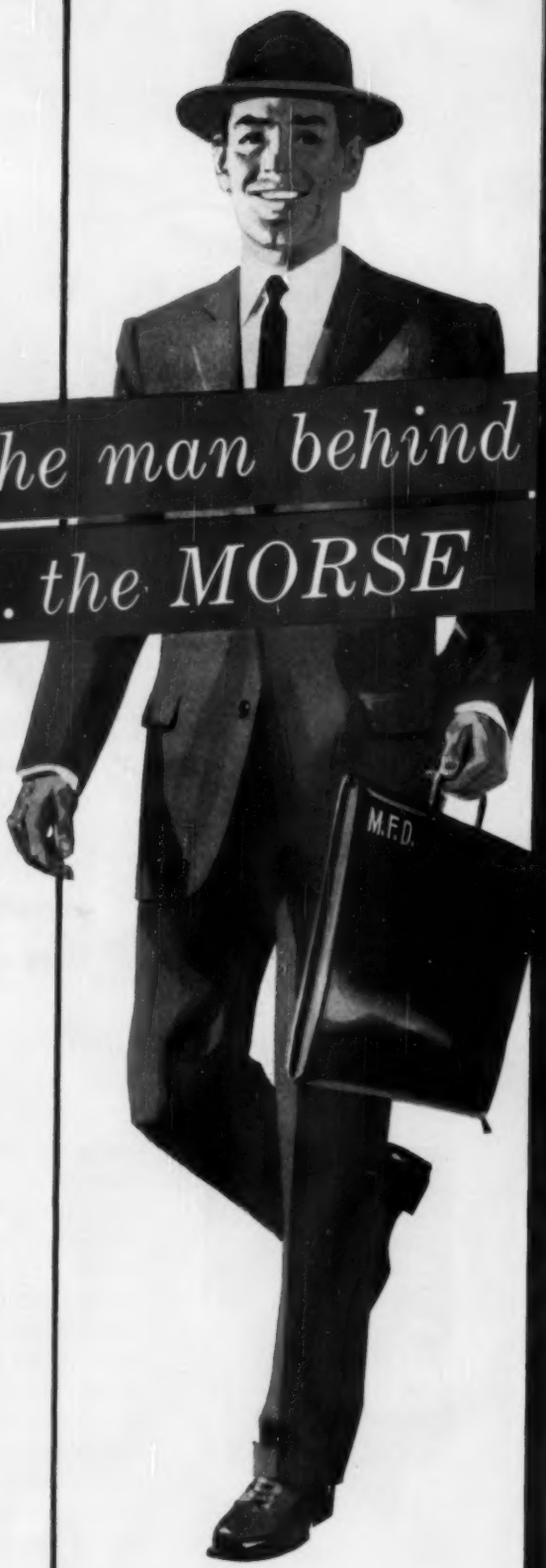
WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

Your friend
indeed
when you're
in need...

the man behind the man behind

... the MORSE



Morse Designers...

Morse Engineers...

Morse Modernized Plant...

Morse Master-Craftsmen...

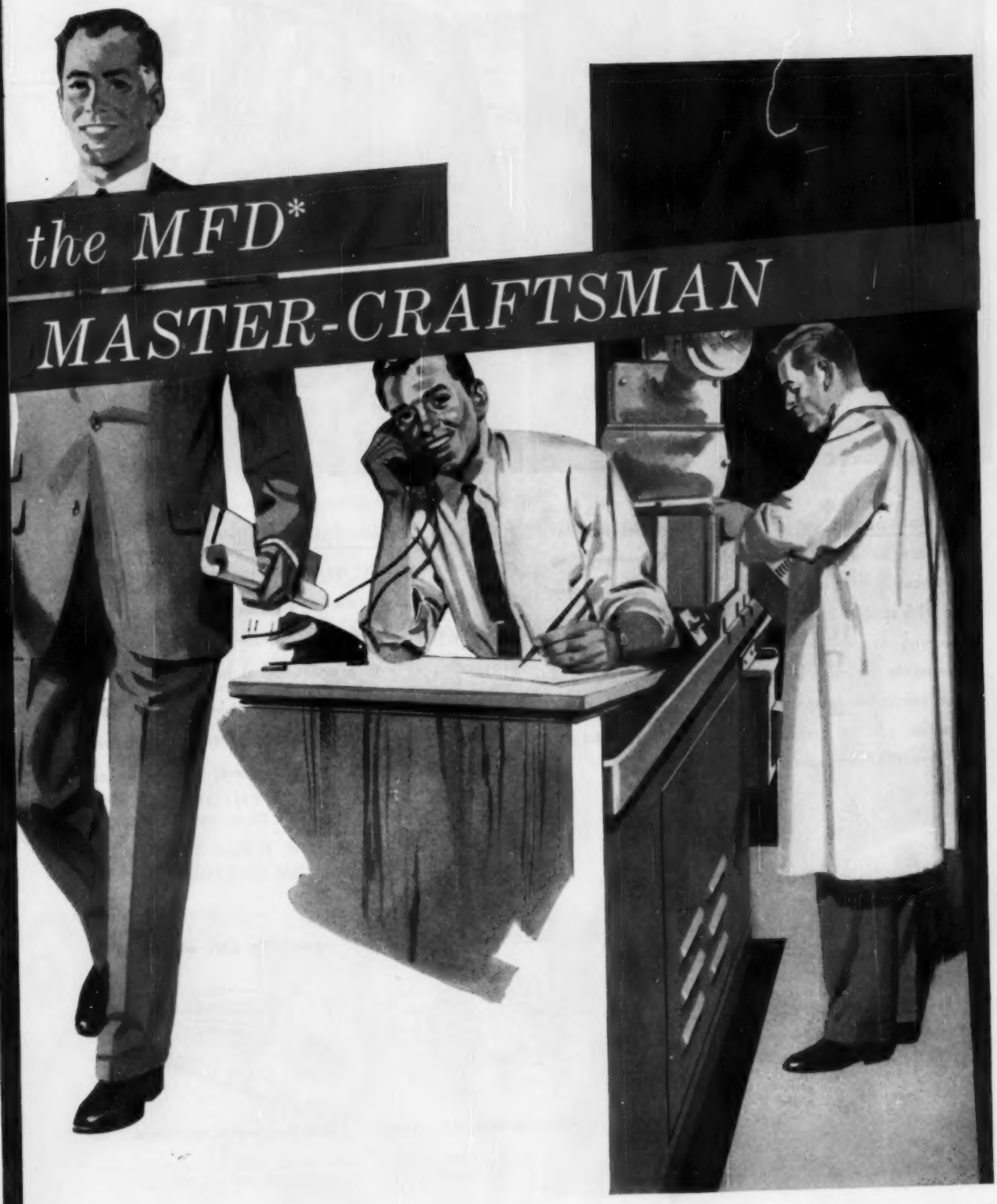
all backing up

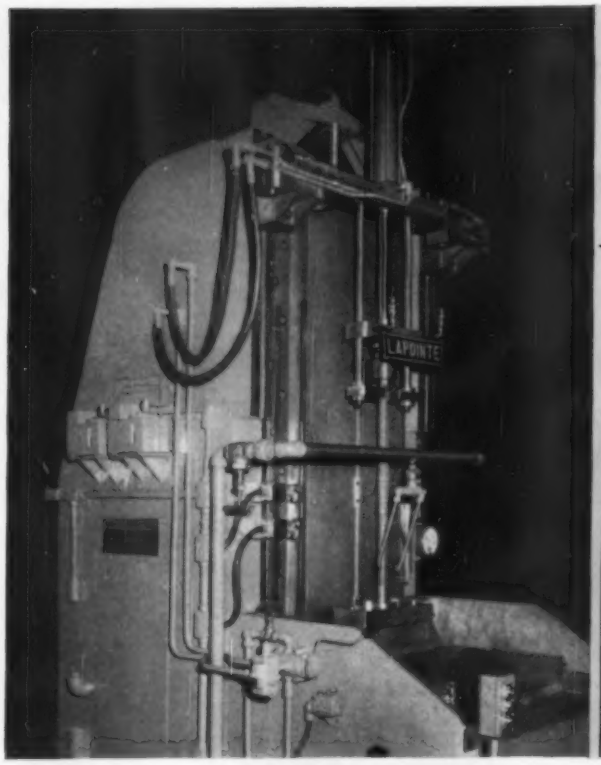
* **THE MORSE-FRANCHISED DISTRIBUTOR**

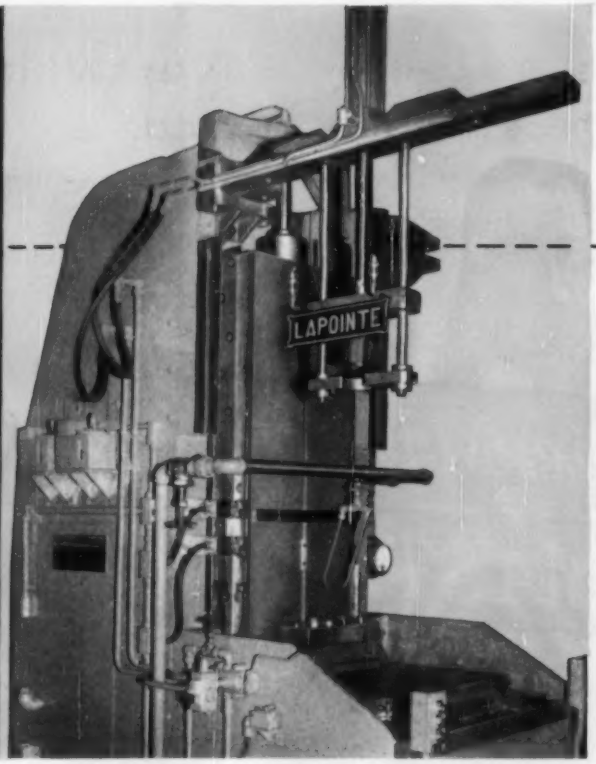
MORSE TWIST DRILL & MACHINE COMPANY

New Bedford, Mass.

A Division of VAN NORMAN INDUSTRIES, INC.
Warehouses in
New York, Chicago, Detroit, Dallas, San Francisco


the MFD*
MASTER-CRAFTSMAN

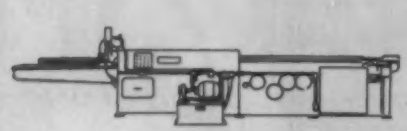




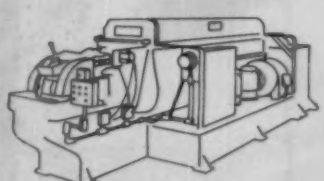
Internal splines and all types of round and irregular holes can be accurately broached to extremely fine tolerances on this Lapointe Broaching Machine, as shown here with special attachment in position for pull-down broaching. Bracket can be moved up or down to accommodate different length broaches . . . puller and lifter mechanism provides automatic handling of the broaches . . . the machine can easily be adapted for use of multiple broaches.

Forms in the periphery of turbine discs and practically any other type of surface broaching can be performed on the same Lapointe SRVE Broaching Machine by swinging aside the broach-lifting bracket and proceeding as with a conventional surface broaching machine. This one has the outstanding Lapointe electro-mechanical drive which accounts for extreme smoothness of operation. Capacity 30 horsepower, 72-inch stroke.

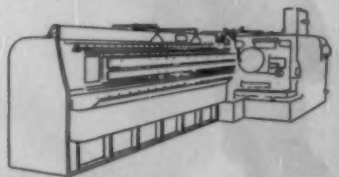
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



60" STROKE HORIZONTAL, ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL, ELECTRIC

and speaking of **versatility** in broaching machines, here's one that leads a

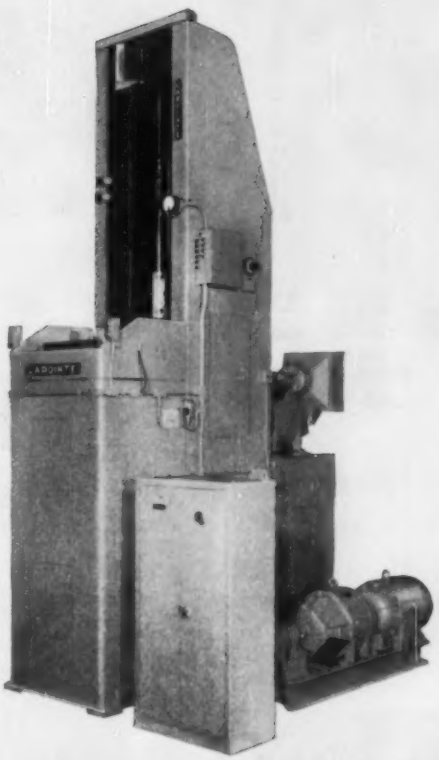
DOUBLE LIFE!

You can do both internal and surface broaching on this Single Ram Vertical Electric

LAPOINTE – BROACHING MACHINE

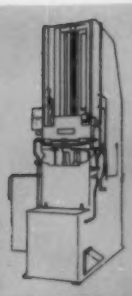
Doing the work of two types of machines, you can now get virtually two machines for the price of *one*. That's because this Lapointe SRVE Broaching Machine is built with a special broach-lifting mechanism that can be swung out of the way when changing over to surface broaching. *It's as simple as that!*

Lapointe engineers have pioneered again — they developed the technique of using a conventional surface broaching machine for *internal* broaching also. This sort of advance-thinking in broaching has been going on for more than 55 years. No other company has accumulated as much valuable experience in the broaching industry, so why shouldn't you expect — *and get* — the most from Lapointe? Ask one of the qualified Lapointe Field Engineers to call on you and explain the money-making features of Lapointe-Broaching, and especially this machine that leads a double life.

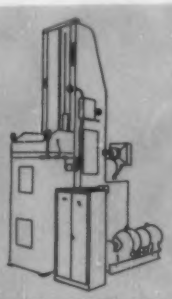


THE LAPOINTE MACHINE TOOL CO.
HUDSON, MASSACHUSETTS • U.S.A. In England: Watford, Hertfordshire

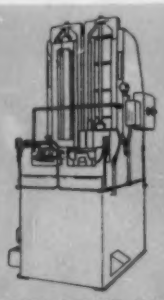
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES



VUE-7 VERTICAL FULL-UP ELECTRIC



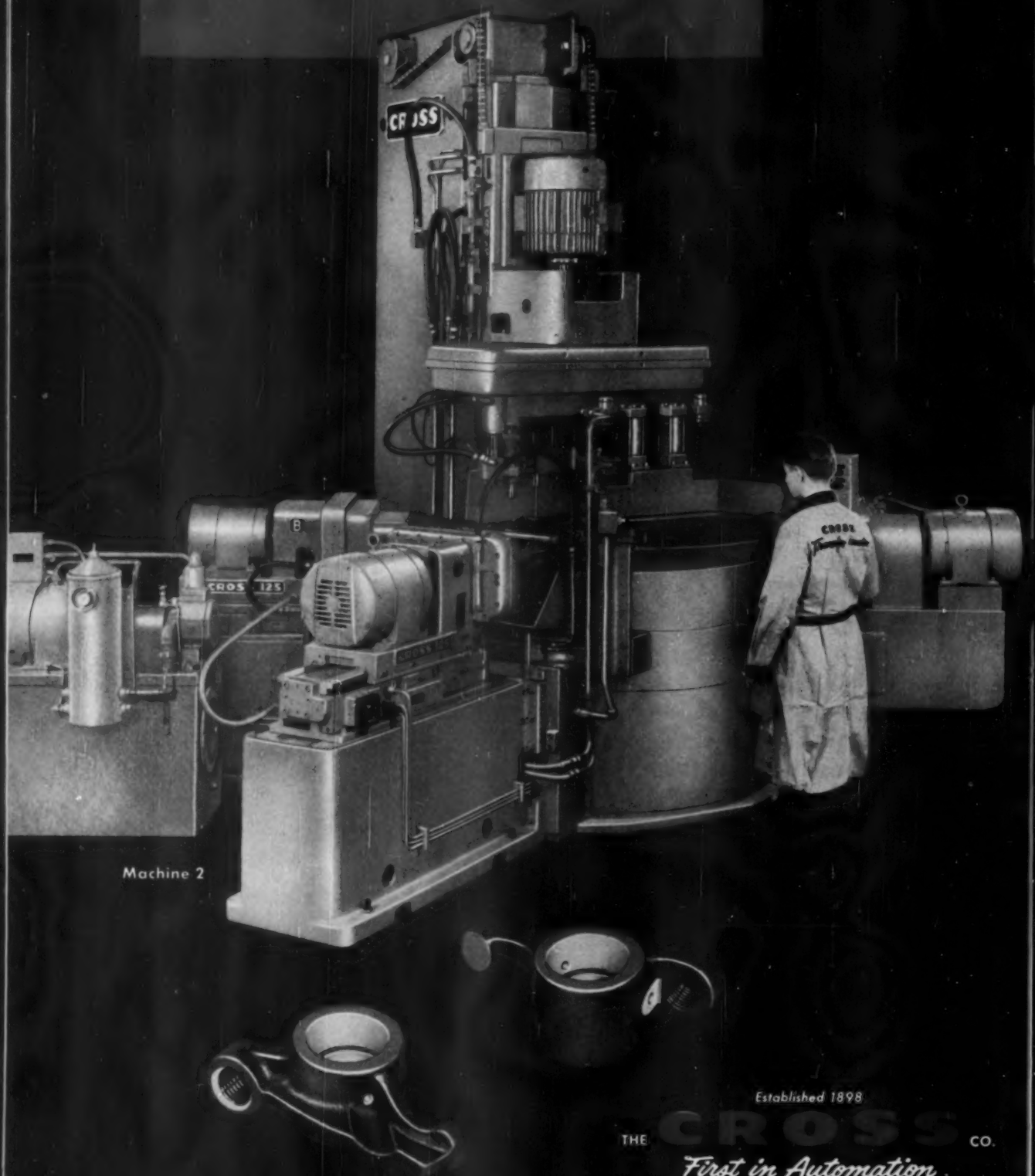
SRVE SINGLE RAM VERTICAL, ELECTRIC



DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE
known to be the best in
BROACHING

Two Dial Type Machines Process Valve Rocker Arms



Machine 2

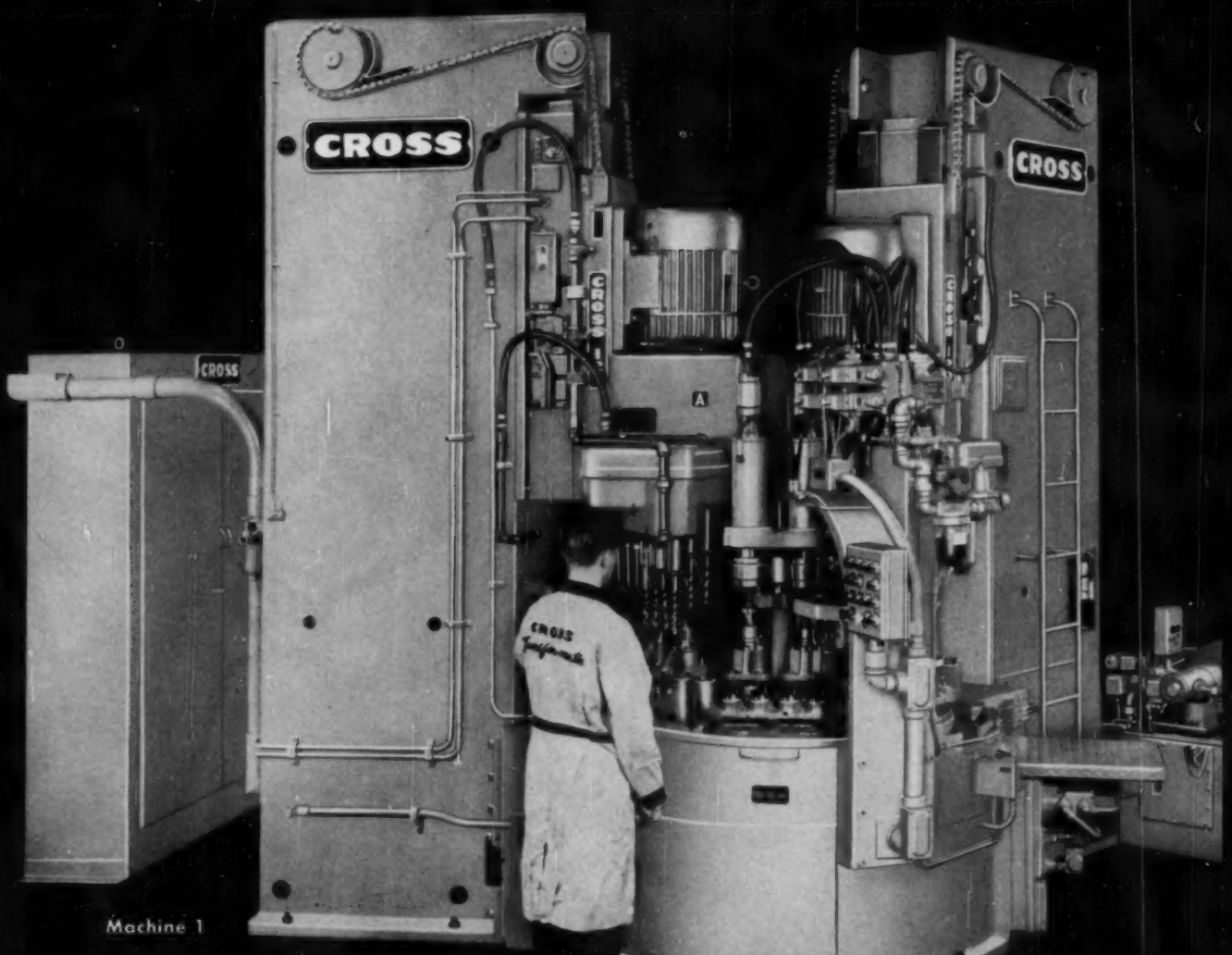
Established 1898

THE CROSS CO.

First in Automation

PARK GROVE STATION • DETROIT 5, MICHIGAN

More Specials by Cross



Machine 1

★ 800 pieces per hour at 100% efficiency.

★ Four parts machined in each station.

★ Machine 1 drills and reams rocker shaft hole; forms oil groove; drills one oil hole. Machine 2 drills, chamfers and taps adjusting screw hole; drills, counterdrills and spotfaces second oil hole.

★ Push button controlled power wrenches operate fixture clamps.

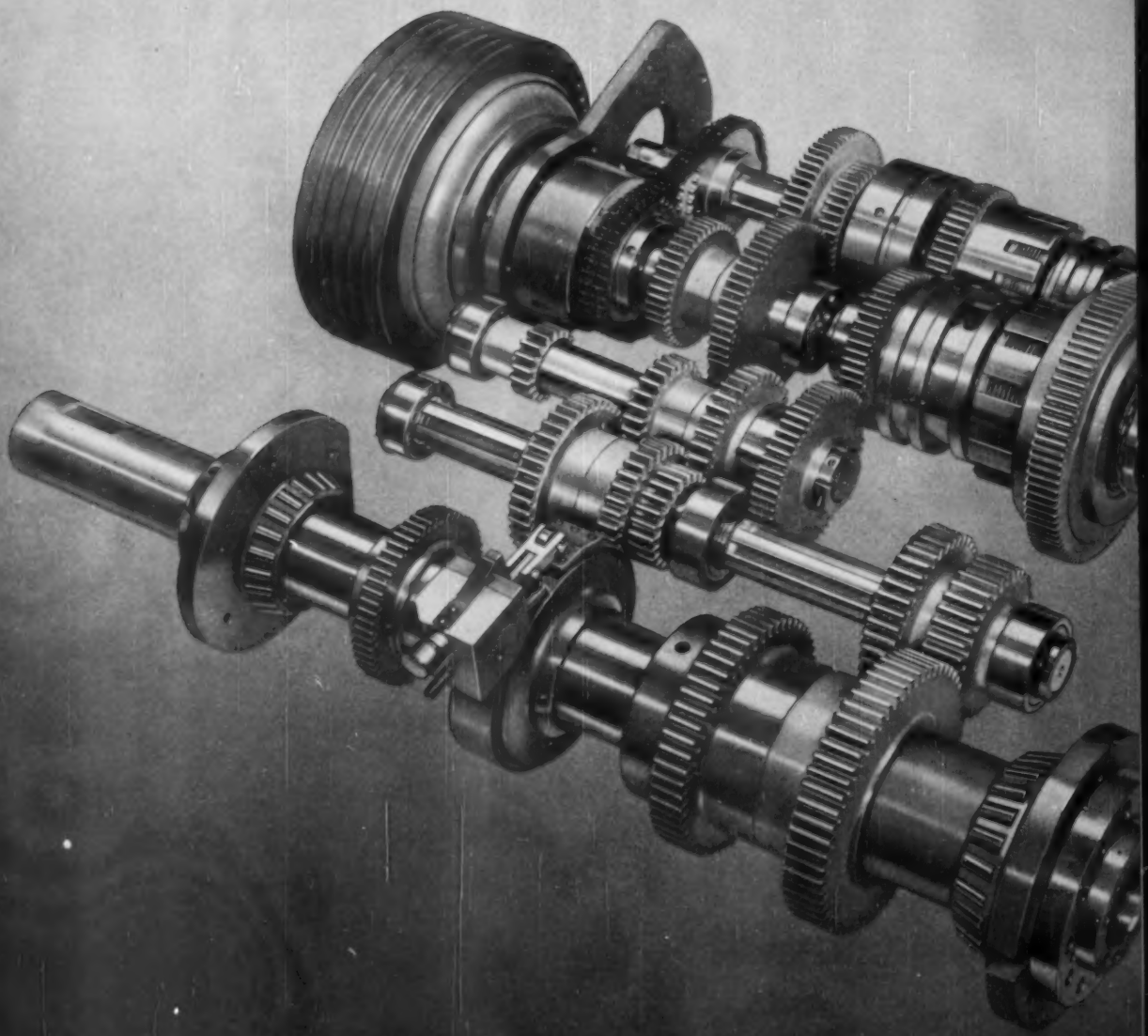
★ Cross "building block" construction provides flexibility for part design changes.

★ Complete interchangeability of all standard and special parts for easy maintenance.

★ Other features: Construction to JIC standards; hardened and ground ways; hydraulic feed and rapid traverse for drilling and reaming; individual lead screw feed for tapping; automatic lubrication; pre-set tooling throughout.

The **power reserve** *and* **range of speeds**

YOU'LL NEED FOR THE



TOOLS OF TOMORROW

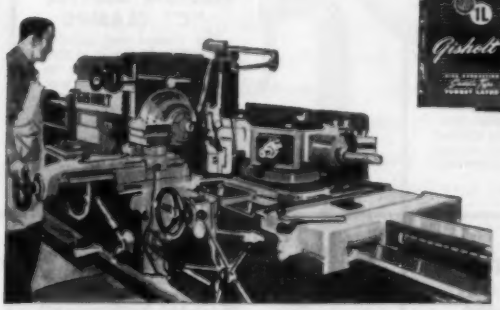
New GISHOLT MASTERLINE SADDLE TYPE TURRET LATHE

WANT MAXIMUM OUTPUT AND ACCURACY from today's carbide tools—with an ample reserve of power and speeds to meet tomorrow's tooling requirements?

That's what you'll get—*now*—from this powerful, rugged Gisholt MASTERLINE Saddle Type Turret Lathe. Prime example of this machine's advanced features is the rugged Headstock Gear Train, shown at the left. Here, you can get 24 different forward speeds—all from a *single*-speed motor. This means you get *full* power *all* the time—a critically important feature for those heavy cuts at punishing feeds.

But that's not all. To give you maximum performance from this powerful gear train, Gisholt designers have backed it with faster speed changes through the Hydraulic Speed Selector (effortless speed shifts without waiting or computing); a hydraulically operated Hi-Lo speed change in a 6:1 ratio (without stopping the spindle or shifting gears); and a new Self-Adjusting Electric Clutch and Brake (smooth, fast starting and stopping, plus more accurate inching of the spindle).

Ask your Gisholt Representative to give you the complete facts. Why not call him today?



ASK FOR complete set of Gisholt MASTERLINE Saddle Type Turret Lathe Bulletins.

GISHOLT MACHINE COMPANY

MASTERLINE GISHOLT SINCE 1887

Madison 10, Wisconsin, U.S.A.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • PACKAGING MACHINES • MOLDED FIBERGLAS PLASTICS

ARMSTRONG

Drop Forged CLAMPS

LEADERS IN THE DROP FORGED CLAMP FIELD

. . . in design, machining and strength; in completeness of line in both sizes and types.

Designs are based on a full knowledge of clamp uses and requisites. Drop forging assures die-perfect form, texture toughness and freedom from structural faults. Maximum stiffness is attained by a discerning selection of steels with accurate controlled heat-treating, tempering and testing.

For dependability and long useful life, specify and standardize on ARMSTRONG Drop Forged Clamps.

Write for new ARMSTRONG General Catalog showing almost 5000 industrial tools.

ARMSTRONG BROS. TOOL CO.
5215 W. ARMSTRONG AVE. • CHICAGO 30, U.S.A.

EXTRA DEEP THROAT "C" CLAMPS

Provide extra clearance required for some work. Extremely stiff for weight. Screws and hubs are accurately machined and aligned with ground seats; have sliding pin handles and free-acting swivel caps on point. Bodies have smooth sandblast finish.
(11 sizes to 12" opening)

HEAVY DUTY "C" CLAMPS

Universally recognized as strongest "C" clamps made. Longer hub holds screw alignment against terrific side strain; permit tighter clamping and multiplies thread friction against loosening. Alloy steel screws are hardened at point to prevent upsetting. Ground seat.
(8 sizes to 12" opening)

MEDIUM SERVICE "C" CLAMPS

The design and careful selection of steels in this type clamp combine to give it maximum strength and stiffness consistent with convenient weight. Heat treated screw with sliding pin handle and swivel cap on point. Ground seat.
(9 sizes to 18" opening)

TOOL MAKERS "C" CLAMPS

Quality steels, drop forged, heat treated and accurately machined with ground seats. Drop forged screws have both "wing nut" handle for convenience and square necks for tight setting with a wrench. Either "plain" or "swivel" screw types.
(Four sizes: 1", 2", 3" or 4" maximum opening)

SPATTER RESISTANT WELDERS "C" CLAMPS

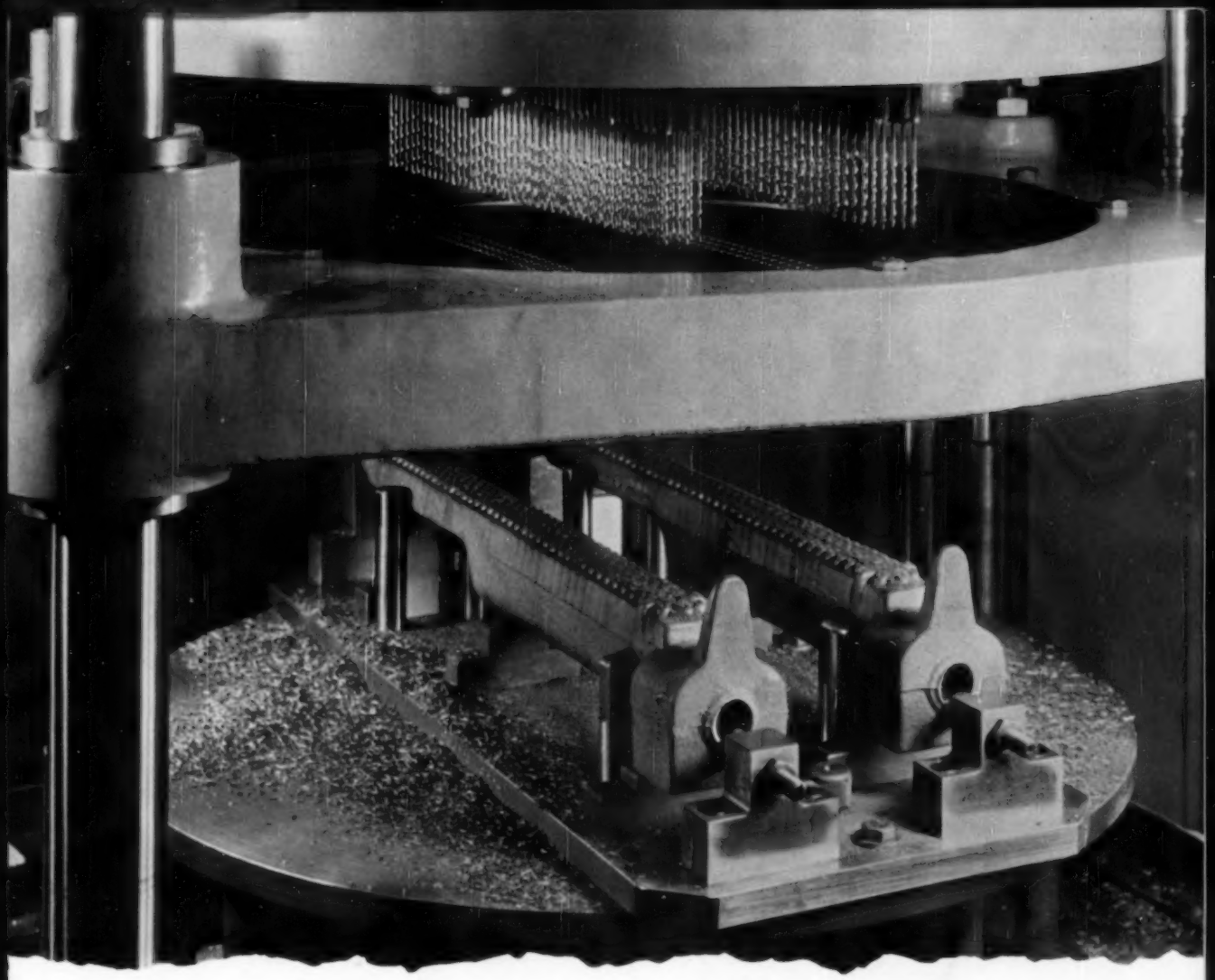
Extra Deep Throat Pattern (see above). Body, Swivel and Screw are cadmium plated over all to resist welding spatter.
(8 sizes Capacities to 12" opening)

MACHINISTS' CLAMPS

Jaws drop forged, carefully machined and hardened, are extra heavy; will not bend or spring on a short bite and are faced true. Will grip non-parallel surfaces because the under face of the center screw is convex, fitting into a concave seat for tilting.
(Four sizes: Capacities to 4¼" opening)

PARALLEL CLAMPS

Carefully machined from selected grade steel and hardened. Particularly suited for holding work together when drilling or tapping. Rounded jaw ends increase clearance in close quarters. Spring clip holds loose pin in alignment while tightening or loosening.
(3 sizes: Capacities to 2½" opening).



Uniform quality
and high performance of
CLE-FORGE High Speed Drills
can help you reach
production quotas

COSTLY "DOWN TIME" REDUCED!

● You can keep your drilling operations *on schedule* with CLE-FORGE High Speed Drills. These fine quality tools give superior performance on *every set-up* . . . and you can rely on their *uniformity* day after day, month after month, year after year.

◈ Why not ask a Cleveland Service Representative for suggestions on reducing "down time" and increasing production in *your* shop? Contact our nearest stockroom, or . . .

TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street • Cleveland 14, Ohio
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58
E. P. Barrus, Ltd., London W. 3, England

MEMORANDUM
FROM ENGINEERING DEPARTMENT
12/12/56
Design Group
Att.: C. D. Smith
Vibrating Conveyor #3 broke down after approximately
17,000,000 cycles of operation. Spring return lever
failed, due to low fatigue resistance. Flexloc locknuts
were, but still locked in original positions.
Recommendations:
1) Redesign lever to give increased strength in
center section.
2) Eliminate side play in lever motion which has
been causing excessive wear in related parts.
3) Continue use of Flexloc locknuts.
B.F.W.

Why designers specify FLEXLOC self-locking nuts

Where products must be tough . . . must stand up under vibration, shock and abuse . . . designers specify rugged, reliable, precision-built FLEXLOC self-locking nuts as fasteners.

HERE'S WHY:

FLEXLOC locknuts are strong: tensile strengths far exceed accepted standards. They are uniform: carefully manufactured to assure accurate, lasting spring tension in the flexible locking collars. And they are reusable: rough screw threads, repeated removal and replacement, frequent adjustments will not affect their locking life.

Standard FLEXLOC self-locking locknuts are available in a wide range of standard sizes and materials, to meet the most critical locknut requirements. Your authorized industrial distributor stocks them. Write us for complete catalog and technical data. Flexloc Locknut Division, STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

FLEXLOC LOCKNUT DIVISION

STANDARD PRESSED STEEL CO.

SPS

JENKINTOWN PENNSYLVANIA

Instantly—the right speed for cutting any metal

with the

W-T WALKER-TURNER

16" VARIABLE-SPEED

BAND SAW

Just turn this wheel for any speed wanted— 50 to 3500 sfm — while saw is running!

With its quick-change, variable speed drive, this Walker-Turner 16" Band Saw can be adjusted instantly, *while the machine is running*, to the correct cutting speed for any metal —even tough steel. Speed changes are fast, smooth and safe —as easy as dialing a radio. There's no lost production time for belt or pulley changes and an indicator shows the exact cutting speed.

In addition, this versatile "Light-Heavyweight" is priced surprisingly low and features big capacity, adjustable saw guides, quick-change Carter Jiffy Tires, and strong construction. For a demonstration, call your W-T distributor. He's listed under "Tools" in your classified telephone directory.

WALKER-TURNER PORTABLE BLADE WELDER
Available at extra cost. ¾" blade capacity. Pays for itself quickly in savings through use of coiled blade stock.

walker-turner

MAIL COUPON FOR COMPLETE DETAILS!

WALKER-TURNER
Division of Rockwell Manufacturing Co.
Dept. WG-21, 400 N. Lexington Ave., Pittsburgh 8, Pa.

☐ Please send name of my Walker-Turner distributor.
☐ Please send literature on Walker-Turner Band Saws.

Name_____

Address_____

City_____ Zone_____ State_____

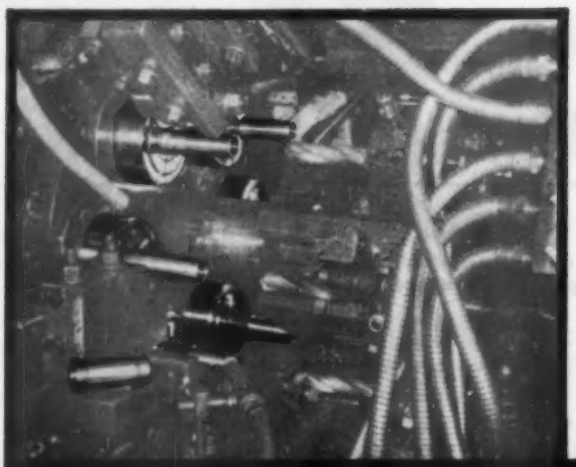
HARDINGE
ELMIRA, N.Y.

When Ordering Automatics

Specify **HARDINGE Style "S" Sure-Grip Master Collets and Pads**

and **HARDINGE Style "B" Master Feed Fingers and Pads**

Photo of Model 601 New Britain Automatic courtesy New Britain-Gridley Machine Division.



Your automatics perform best with HARDINGE Master Feed Fingers and Master Collets. The name HARDINGE is your guarantee of accuracy and durability . . . allows you to reap the full benefit of the inherent accuracy of your machines.

HARDINGE Master Collets are ***the only masters with no work pressure on the screw*** . . . last longer . . . retain accuracy.

HARDINGE Master Feed Fingers and Pads save 30% to 80% over conventional solid feed fingers.

All sizes for all automatics.

Prompt Delivery from these Stock Locations: Atlanta, Baltimore, Boston, Chicago, Dayton, Detroit, Elmira, Hartford, Los Angeles, Minneapolis, New York, Oakland, Philadelphia, St. Louis, Toronto, Montreal.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

new clean-sweep styling and modern power features open the way to new production peaks

ALL NEW

totally enclosed

inboard drive

wrap-around crown

power clutch

power brake

power treadle

NIAGARA 30 AND 50 TON PRESS BRAKES*

HERE'S MEANINGFUL STREAMLINING . . . and at its very best! *Everything's inboard:* Motor, belts, flywheel, clutch, brake and gears . . . yes, even the connections, pitmans and ram adjustment mechanism. *Nothing protrudes!*

Resourceful designing has made it possible to provide heavier, deeper uprights with relatively no increase in floor space. Net result: A 50% deeper throat for larger work.

HERE'S PERFORMANCE that can't be matched! These all-new Niagara Press Brakes have a smoothness of action all their own. Niagara Power Features . . . Power Clutch, Power Brake, Power Treadle . . . assure easy, instant response to every command. The ram can be micro-jogged smoothly and softly to a layout line, or stopped on a dime at full speed!

Proved on mighty Niagara Presses, Niagara's Electro-Pneumatic Friction Clutch engages in a fraction of a second, disengages even faster, and *fails safe!* Featuring simplified construction, it's a low inertia, heavy duty unit that's designed to outperform and outlast any other press brake clutch. Friction plates automatically compensate for wear . . . no adjustment required.

Spring applied, Niagara's powerful Air Releasing Brake can't fail for it does not depend on energy (air or electricity) to bring the machine to an immediate halt.

HERE'S RUGGEDNESS to take extreme loads in stride! Niagara's solid, all-welded steel one-piece frame with integral wrap-around crown provides maximum resistance to deflection. *There's nothing to work loose!* Utmost strength and rigidity are assured.

Straddle mounted between anti-friction bearings, hardened steel gears run in a sealed oil bath. Centralized pressure lubrication delivers oil to all main bearings, connection bearings and gibs with a single shot.

PREVIEW THESE ULTRA-NEW MACHINES
Find out what they can do for you by writing for Niagara's new, illustrated Bulletin 90 today.

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

DISTRICT OFFICES

Boston • Buffalo • Cleveland • Detroit • Indianapolis • New York • Philadelphia

Distributors in principal U. S. cities and major foreign countries

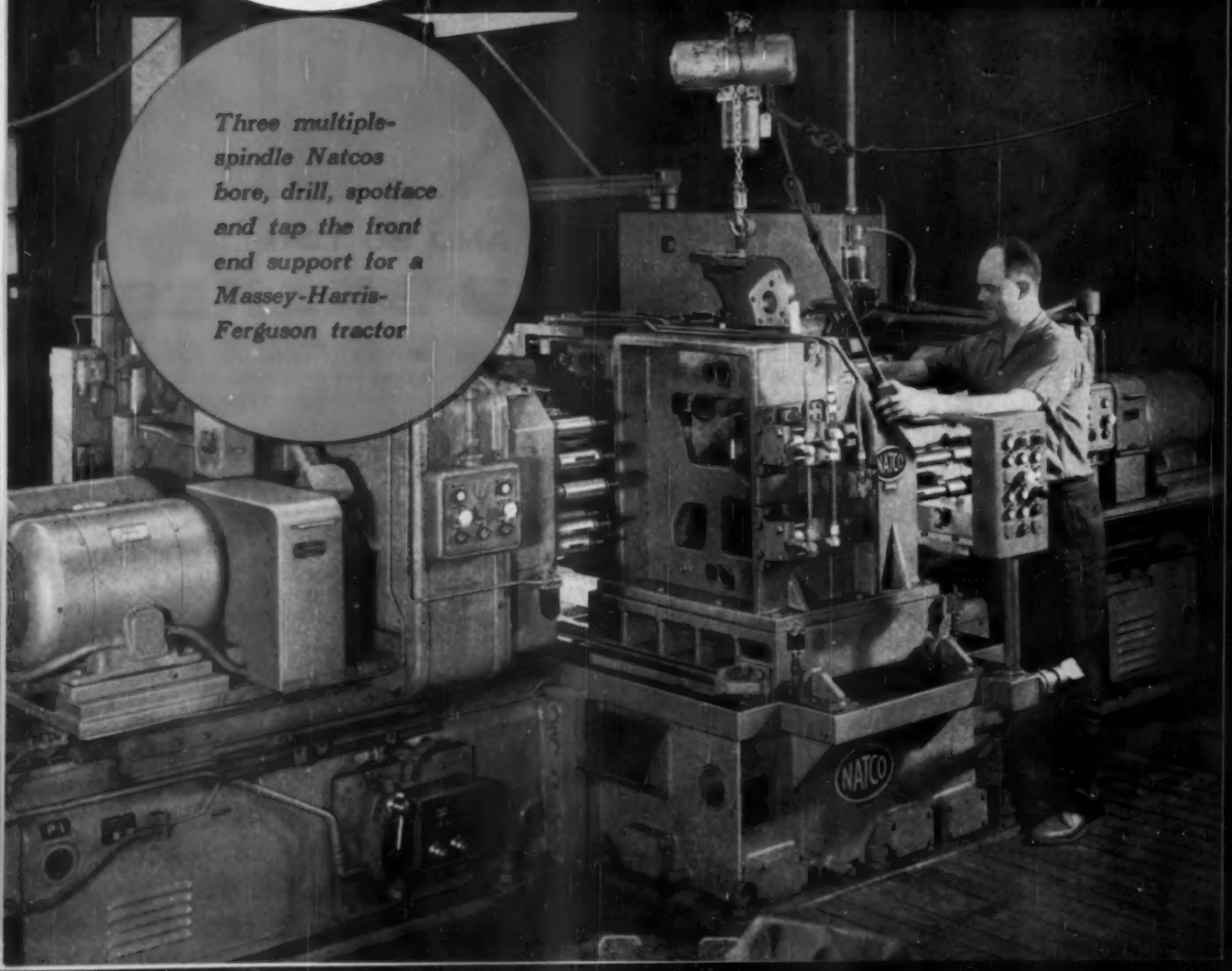
America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work

*Patented & Patents Pending

At Massey-Harris-Ferguson

Natcos Save 100 Parts...

Three multiple-spindle Natcos bore, drill, spotface and tap the front end support for a Massey-Harris-Ferguson tractor



NATCO

60 Man Hours Every

on Rugged Axle Support Castings

Massey-Harris-Ferguson checked it two ways. Nine general-purpose machines would do the job—or 3 Natcos. They chose the Natcos for these reasons:

- *Saving of $30,000 in machine cost*
- *Saving of 60 man hours every 100 parts*
- *Saving of 65% in floor space*

The Natcos handle all drilling, boring, spotfacing and tapping—a total of 67 operations on the 182-pound front axle casting. The casting is heavy, irregular—tough to fixture and clamp. The Natcos meet production requirement of 11 parts per hour.

Natco provided complete tooling which features automatic clamping, cycling and chip blow-out. All three machines are of unitized construction, giving Massey-Harris-Ferguson the flexibility to run different parts of redesigns of the same part.

Let Natco Field Engineers point out cost-saving and time-saving methods on your next drilling, boring, facing or tapping job. Natco offices are located in Chicago, Detroit, New York, Buffalo, Boston, Philadelphia, Cleveland and Los Angeles; distributors in other cities.

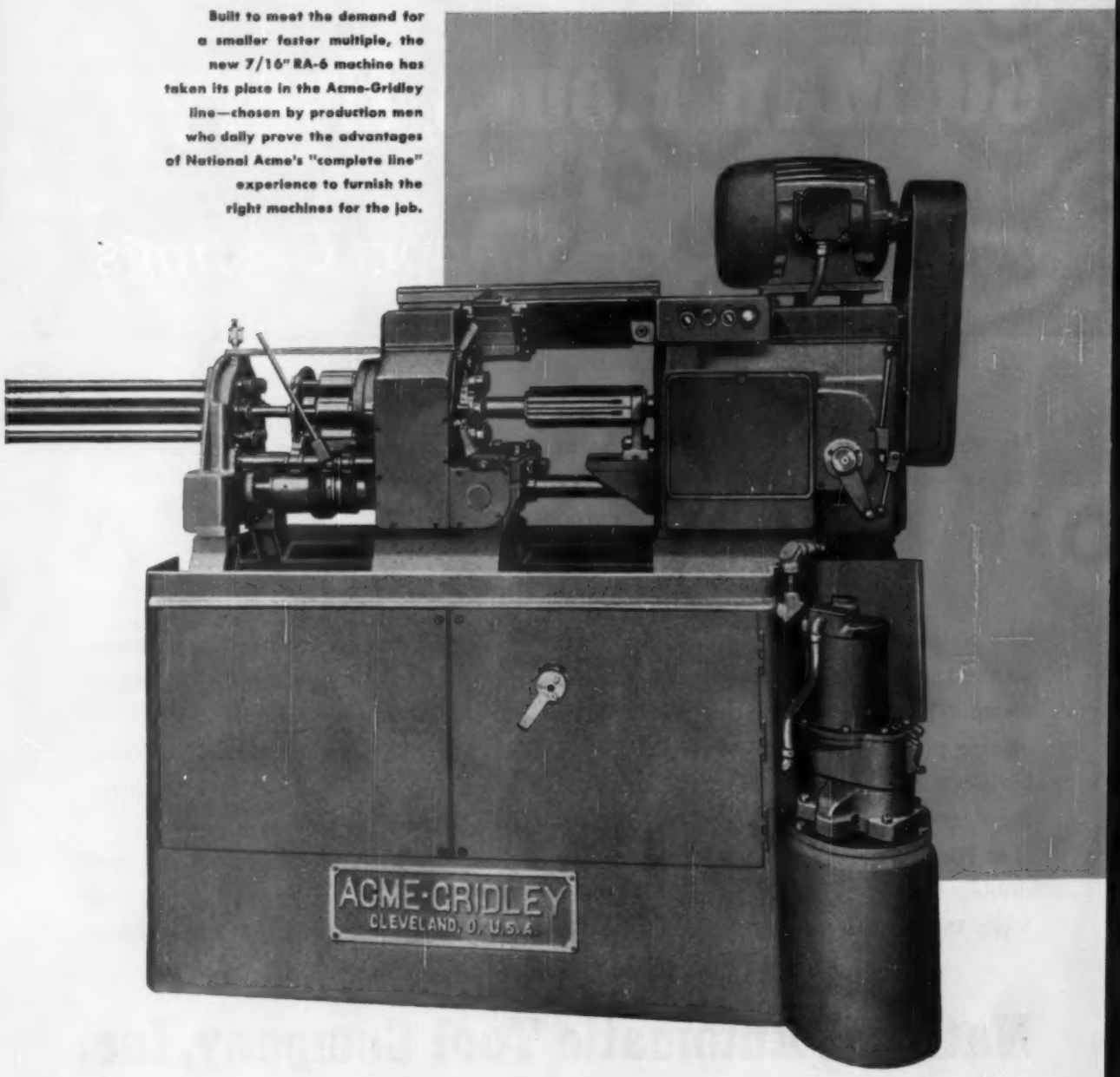
National Automatic Tool Company, Inc.

Richmond, Indiana

Multiple-spindle drilling, boring, facing and tapping machines. Special way-type, index and transfer machines.

LIKE ALL *Acme-Gridley* BAR AUTOMATICS . . .

Built to meet the demand for a smaller faster multiple, the new 7/16" RA-6 machine has taken its place in the Acme-Gridley line—chosen by production men who daily prove the advantages of National Acme's "complete line" experience to furnish the right machines for the job.



. . . THE NEW 7/16" SIX

gives you lowest cost per piece

HIGH PRODUCTION ACCURACY—sustained at highest speeds and feeds through proper weight distribution and support of toolholders without overhang.

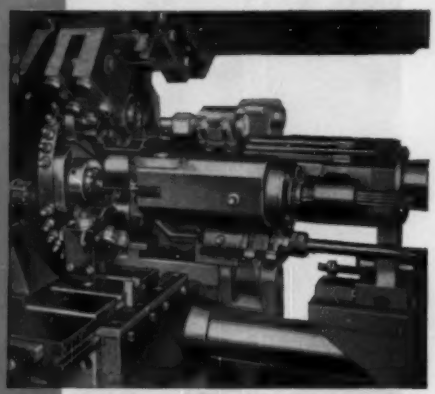
WIDE TOOLING VERSATILITY—through independently operated cross slides, spindle stopping (optional) and a variety of standard and special attachments.

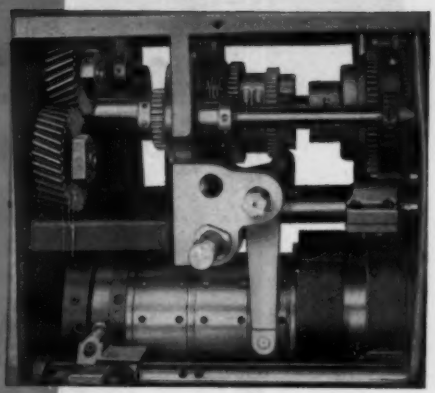
LONG OPERATING DEPENDABILITY—with extra reserve power and strength for top performance with *all* tools.

★ ★ ★

Let our representative show you how Acme-Gridleys can work for you; meanwhile, *write for your copy of* MRA-56 *for specifications of the new 7/16" Six.*

Unusually large tooling zone permits ready access for installation and adjustment of tools and attachments. All slides are wide and heavy, providing maximum support without overhang.





Gear box section accommodates drive control for all accelerated end-working attachments, spindle speeds and feeds . . . easily accessible through large openings on either side.

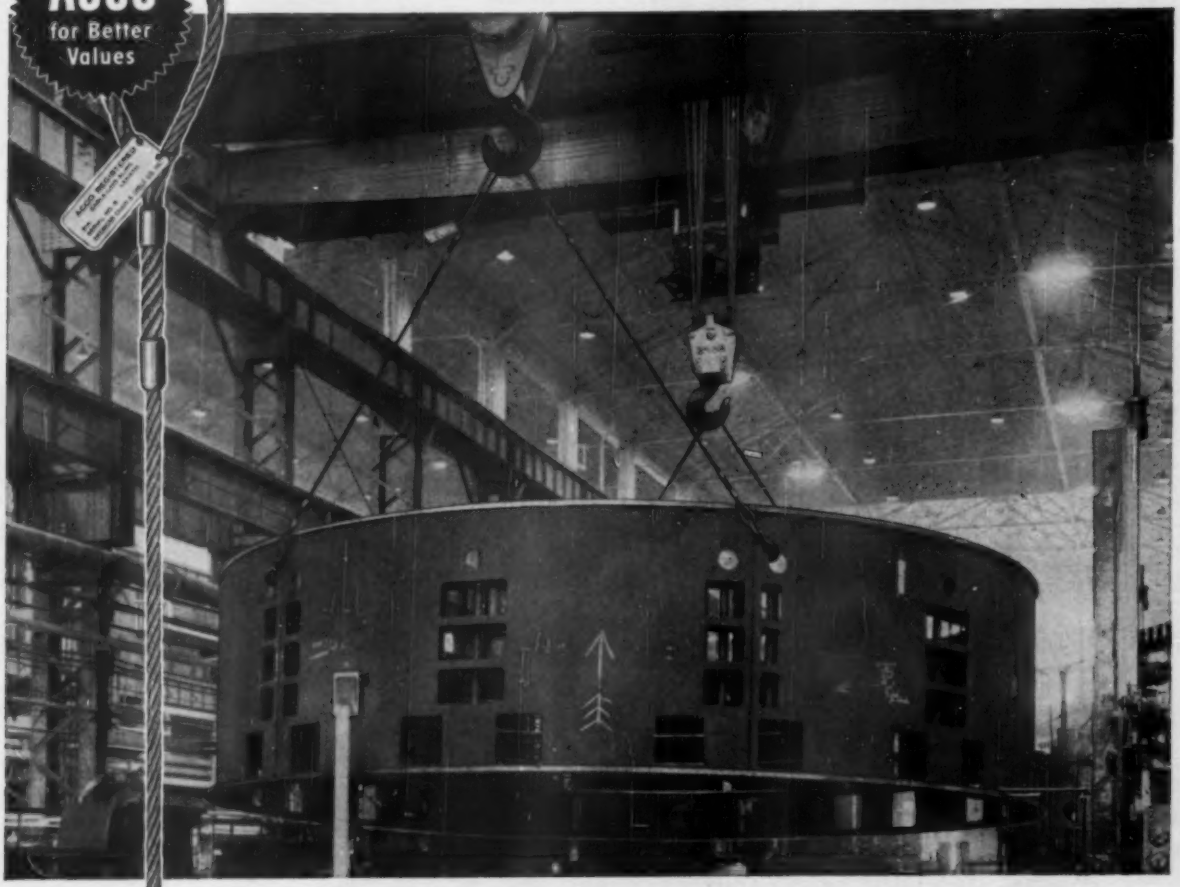
INDEX . . . to lower machining costs . . . with Acme-Gridley **CONTROLLED CYCLE**

National Acme

THE NATIONAL ACME CO.
171 EAST 131ST STREET
CLEVELAND 8, OHIO

Sales Offices . . . Newark, N. J. . . . Detroit, Mich. . . . Chicago, Ill.

ACCO Registered® Wire Rope Slings



Your Most Important Production Operation

...may be lifting your finished product, or a major assembly. A dropped load can result in serious losses from wasted materials and labor...damaged production equipment...disrupted delivery schedules.

The man in your plant in charge of lifting operations has a heavy responsibility. It is good management to provide him with the best possible tools for his job.

The slings he uses are vitally important. The safest slings made are ACCO *Registered* Wire Rope Slings. Each is precision made and pre-tested at twice its working load before leaving the factory.

To protect your production line, call your nearby ACCO Wire Rope Sling distributor.

FREE FOLDER • *Write Wilkes-Barre office for your copy of new Folder DH-532, which gives strengths and weights (for six different lifts) on a full size range of ACCO Registered Cable-Laid Slings.*

WHAT "ACCO REGISTERED" MEANS

1. The best material
2. Unit safety factor (on bodies, rings, links, hooks)
3. Proof test of complete sling to twice the working load limit
4. Actual field service test of each design
5. Metal identification tag on each sling
6. Signed Registry Certificate with each sling

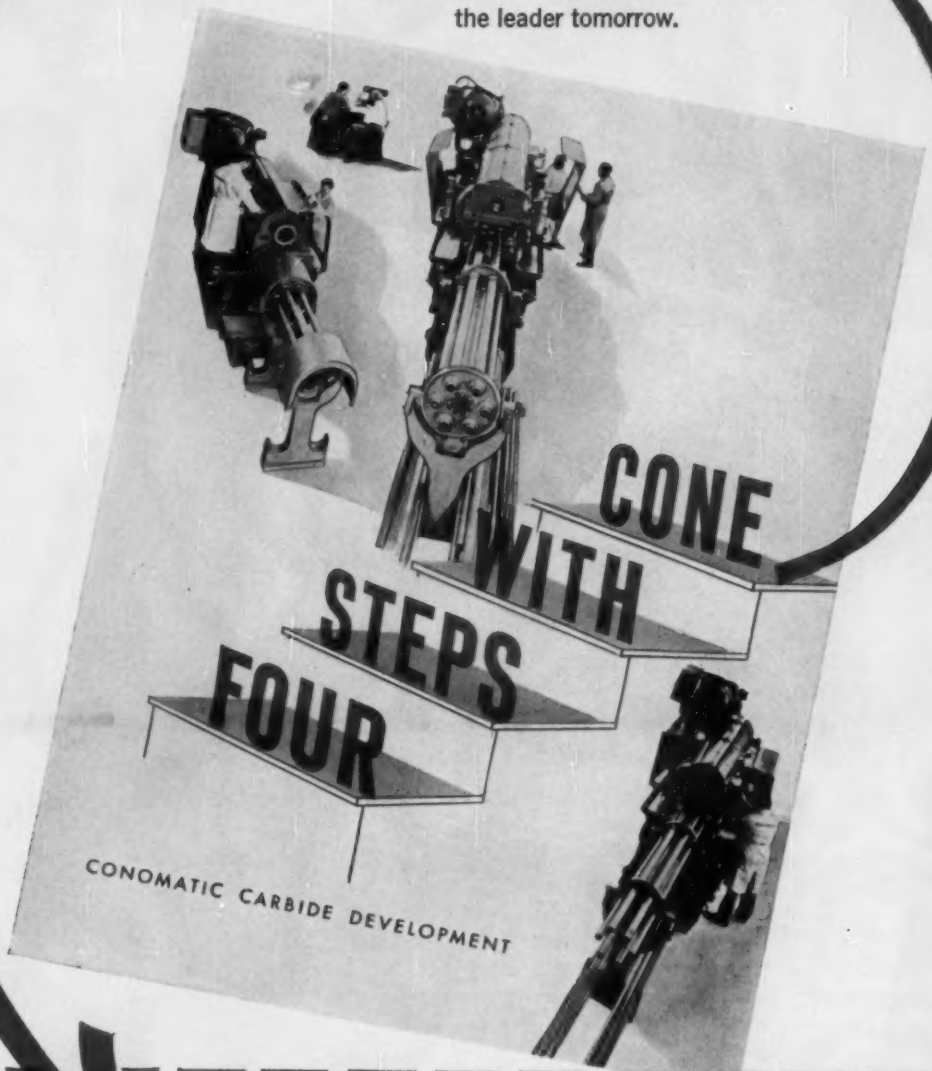
*Trade Mark Registered

ACCO

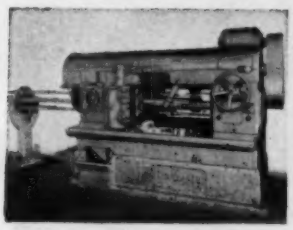
AMERICAN CHAIN & CABLE COMPANY, INC., WILKES-BARRE, PA.

Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn.
In Canada: Dominion Chain Company, Ltd., Niagara Falls, Ontario

If you haven't read this important booklet, your production line may be operating at less than peak efficiency. Your operations may be beating competition with HSS today, but you will likely need carbide tooling to be the leader tomorrow.



Write for your free copy of this important booklet today!



Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.

PERFORMANCE REPORT:

Blanchard No. 18 surface grinders have a long history of outstanding performance. They're economical, extremely accurate and highly productive on a wide variety of jobs.

V-490

STANDARD STEEL WORKS DIVISION
BALDWIN-LIMA-HAMILTON CORPORATION
BURNHAM, MIFFLIN COUNTY, PA.

November 26, 1956

Machinery Associates, Inc.
325 E. Lancaster Avenue
Wynnewood, Pa.

Attention: Mr. C. Dawson Day, Vice President

OUR PURCHASE ORDER 6781-4576
YOUR ORDER W2-1-809

Gentlemen:

In response to your letter of October 12, 1956 relative to the No. 18 Blanchard High Power Vertical Surface Grinder which you furnished to us on the above order, I wish to advise that this machine has been entirely satisfactory. The machine was purchased primarily for grinding form and hollow bore cutters for our machine shops and the machine was installed in our Small Tool Department. We estimate that the savings which we have already experienced will allow us to amortize the machine in a period of approximately one year. Since the work load on cutters alone kept the machine busy only approximately one-third of the time, we have been able to do additional grinding which was formerly done on other machines and have been able to realize the same economies as we did on the grinding of the cutters.

Yours very truly,

W. E. Shiesler, Jr.
Chief Engineer

PUT IT ON THE BLANCHARD

Send today for your free copies of "Work done on the Blanchard", fifth edition, and "The Art of Blanchard Surface Grinding", third edition.

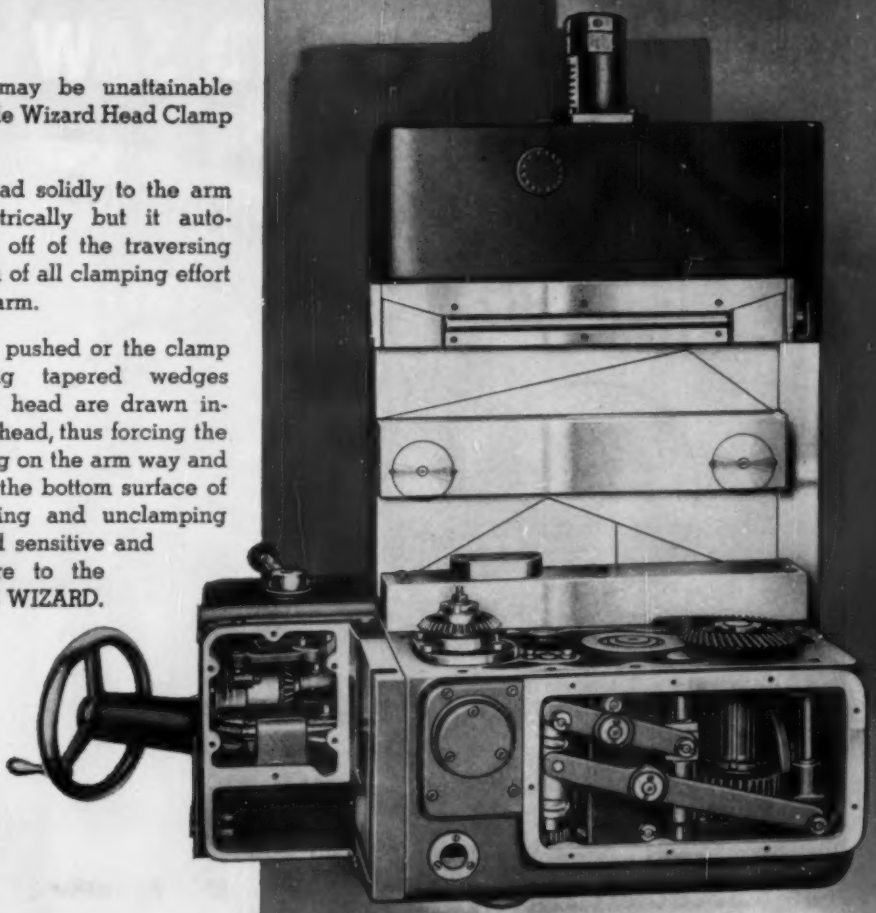
THE BLANCHARD MACHINE COMPANY
64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

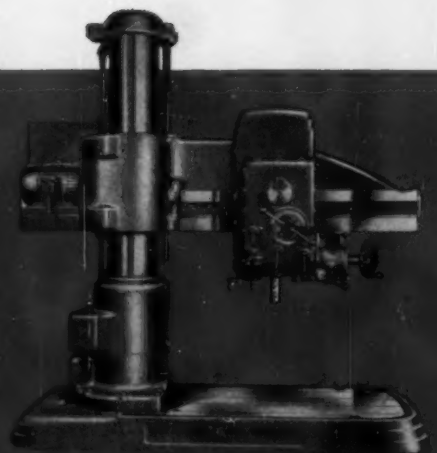
Clamping Perfection

Theoretically perfection may be unattainable but practically the new Hole Wizard Head Clamp is perfect.

It not only clamps the head solidly to the arm either manually or electrically but it automatically raises the head off of the traversing rollers, thus relieving them of all clamping effort and binds it solidly to the arm.

When the clamp button is pushed or the clamp lever actuated, opposing tapered wedges between the arm and the head are drawn inwardly at each side of the head, thus forcing the head off of its roller bearing on the arm way and wedging it solidly against the bottom surface of of the arm. This clamping and unclamping action is instantaneous and sensitive and adds another plus feature to the "AMERICAN" NEW HOLE WIZARD.





Plus features

Speaking of Plus Features here are a few you will want in your next radial.

- Centralized Control.
- Lightning-fast Direct Reading Speed Change.
- Nitrided Spindle and Sleeve—practically wear proof.
- Timken mounted column unit defies deflection.
- Raybestos covered, spring steel tapping attachment friction bands, quick acting, wear proof, permitting 40% speed-up for spindle reverse.

These are just a few . . .
learn the others from bulletin No. 328

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

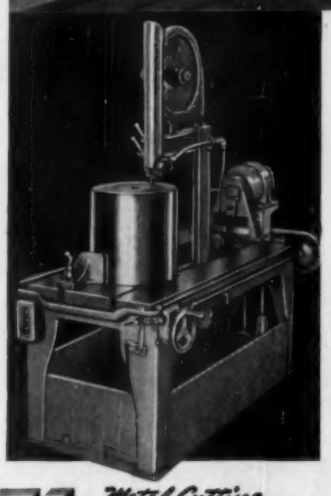
MARVEL NO. 8 BAND SAW makes a tough job EASY...

FLOOR TO FLOOR IN 5 HOURS... no special jigs, fixtures or set-up required

The versatility, simplicity of operation and unmatched efficiency of a MARVEL No. 8 Universal Metal Cutting Band Saw makes it the best all-around saw you can buy.

Take the job illustrated, as an example. Three equally spaced re-entrant cuts were required to segment a large, heavy die forging. The work was merely placed on the table between the vise jaws with the first lay-out line positioned to bisect the blade. Feed pressure was set on the direct-reading scale and the cut started. On a MARVEL No. 8, the work is always stationary and the blade is fed into the work; the cutting edge of the blade is always square with the table throughout its full feed traverse, which eliminates the need for special fixtures. The pre-set Automatic Overload-Relief Power Feed kept the blade moving into the work only as fast as it could freely remove the metal; as the vertical length of the cut decreased, the blade was automatically fed faster, thus increasing cutting speed. Upon completion of a cut, the blade was rapidly returned to its starting position by a rapid traverse handwheel located at the operator's position. Succeeding cuts were made in the same manner, with the same ease and speed.

Jobs like this aren't done every day, but they serve to emphasize the versatility of the MARVEL No. 8, a truly universal metal cutting saw. If you cut, machine or fabricate metal, this is a sawing machine you should know about. Write for catalog.



ARMSTRONG-BLUM MFG. CO.
5700 BLOOMINGDALE AVE. · CHICAGO 39, ILL.

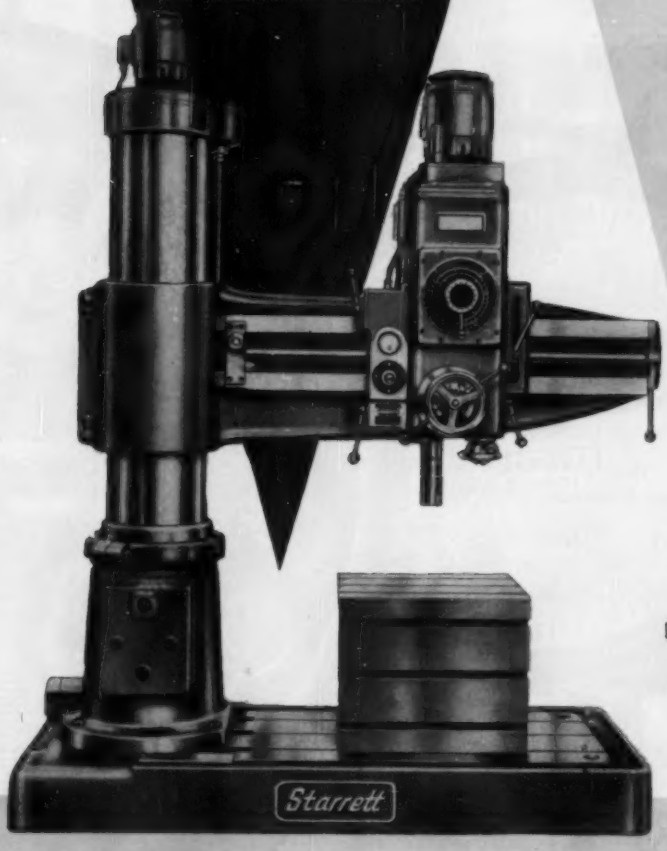
MARVEL Metal Cutting SAWS
Better Machines–Better Blades

S-1302

STARRETT RADIAL DRILLS

WORLD'S BEST VALUES

For . . . MAXIMUM EFFICIENCY LONGER LIFE



SIZES:
2½' to 6' with 10", 12½" & 14½" columns. Ground nickle-chrome steel gears. Safety feed. Preselector depth control. Automatic lubrication.
from $1995. to $6985.

No. 5 Morse Taper with centralized electro-mechanical clamping device

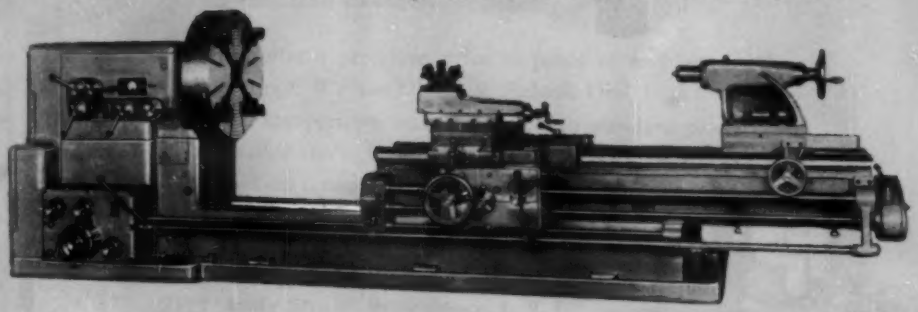
IMPERIAL LATHES

FLAME HARDENED, GROUND BED WAYS. HEAT-TREATED, HARDENED GEARS THROUGHOUT. SUPER PRECISION, ROLLER SPINDLE BEARINGS. EXTREMELY HEAVY CARRIAGE. AUTOMATIC LUBRICATION.

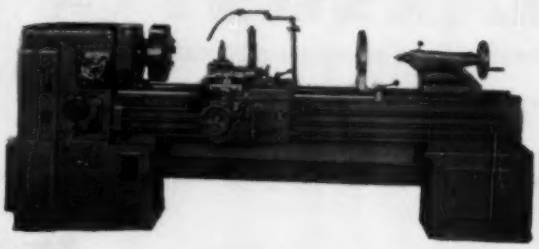
Available sizes from 12" to 67" swing, priced from $1,298 for 12" to $19,490 for 67".

Slightly higher on west coast.

MODEL P.S. 34"/61" UNIVERSAL SLIDING BED GAP LATHE **$12,990**



MODEL M.P. 24"/35" swing **$7,985**



instantaneous "preselector" for speed control

RENTAL PLANS, LIBERAL TERMS

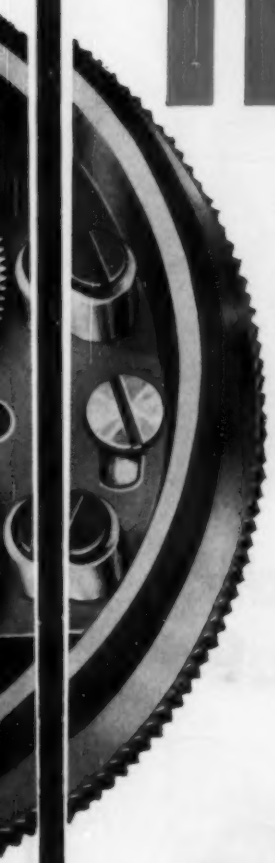
AARON
MACHINERY CO., INC.

DEP'T "A"
45 CROSBY STREET
NEW YORK 12, NEW YORK
WAlker 5-8300

Branches at: Buffalo, N. Y., Mineola, N. Y., Los Angeles, Cal.

See the most extensive line of Dial Indicators in Catalog 55. Ask for your copy.

TRUSTWORTHY



DESIGN . . . At Federal, good design is an attainment to be improved upon. Regular precision bearings are good, but Federal introduced *Jeweled Bearings* which are virtually frictionless and retain their precision longer. A movement integral with the Indicator case is good, but Federal devised the Unit Movement which permits much greater assembly accuracy. The conventional indicating hand is good, but Federal's *dynamically balanced hand* reduces inertia and puts less stress on the movement. And so on . . . through Cushion Movement, Hardened Gears, Wetproof and other design advances, each pioneered by Federal but only after repeated trials had proven they were practical improvements. This cautious yet progressive policy controls the production of all new ideas incorporated in Federal Dial Indicators. It is your guarantee of obtaining the best.

PERFORMANCE . . . ALL Dial Indicators must meet established standards. Federal Dial Indicators must EXCEED them. Closer tolerances at critical points . . . extra steps in production . . . more critical inspection . . . all contribute to the highest quality. In short, better habits of production provide that margin of excellence beyond mere acceptance. True confidence begins with that margin wherein lies the extra accuracy . . . strength . . . dependability needed to fulfill the severe, as well as the ordinary requirement . . . without question. This is why more Federal Dial Indicators are used than all others combined.

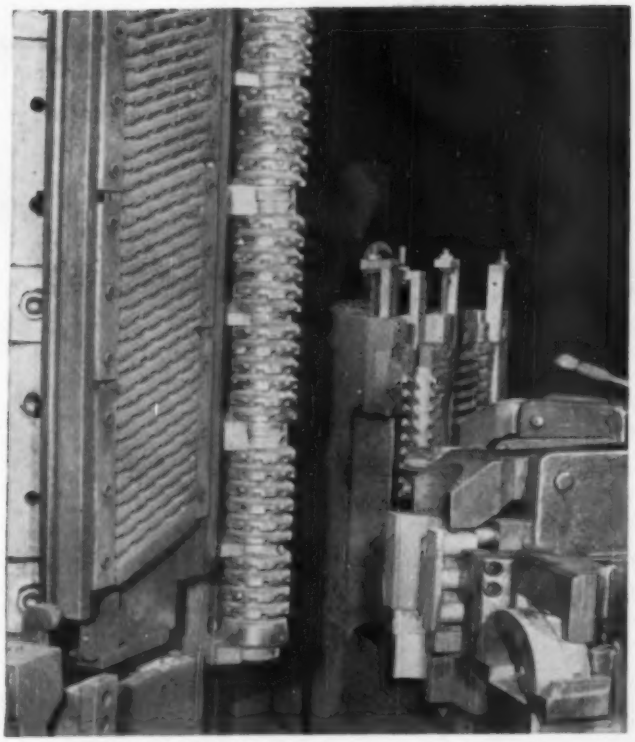
PRICE . . . We do not offer a premium price as proof of excellence. We wouldn't because it is not proof. *We can't* because Federal Dial Indicators are generally *lower* in price than competitive makes. Lower than standard prices for a better product are only possible through the large volume demand generated by industry's wide *preference* and the economies of manufacturing efficiency. The sum total significance to you is . . . Federal Dial Indicators are a better investment.

FEDERAL PRODUCTS CORPORATION
7127 Eddy Street, Providence 1, R. I.

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging



Grade 883 increases broach life 2500%

Highly abrasive cast iron used for this bearing cap at Studebaker caused conventional broaches to fail after maximum run of only 3,600 parts. After the switch to Grade 883, initial broach ran 50 days, produced 90,000 parts without service. Over-all machining costs were reduced 22%.

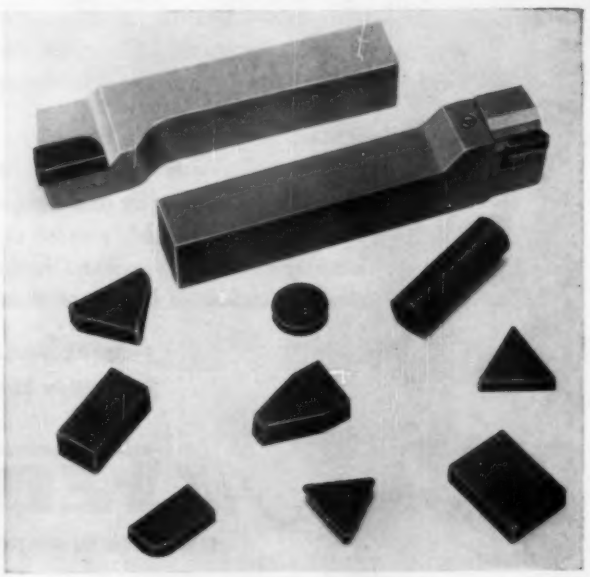
Grade 370 saves 155 hours' machining time

Normal machining time on this 165-ton cast-steel propeller runner at S. Morgan Smith Co. was 220 hours. Despite abrasive patches, and interrupted cuts, Grade 370 cut machining time to 65 hours – ⅓ the time. At 154 fpm, Grade 370 ran 30 hours without changing – compared to 6-8 hours with previous tools.

WHY MACHINE OUTPUT GOES UP, WITH CARBOLOY® CARBIDES ON

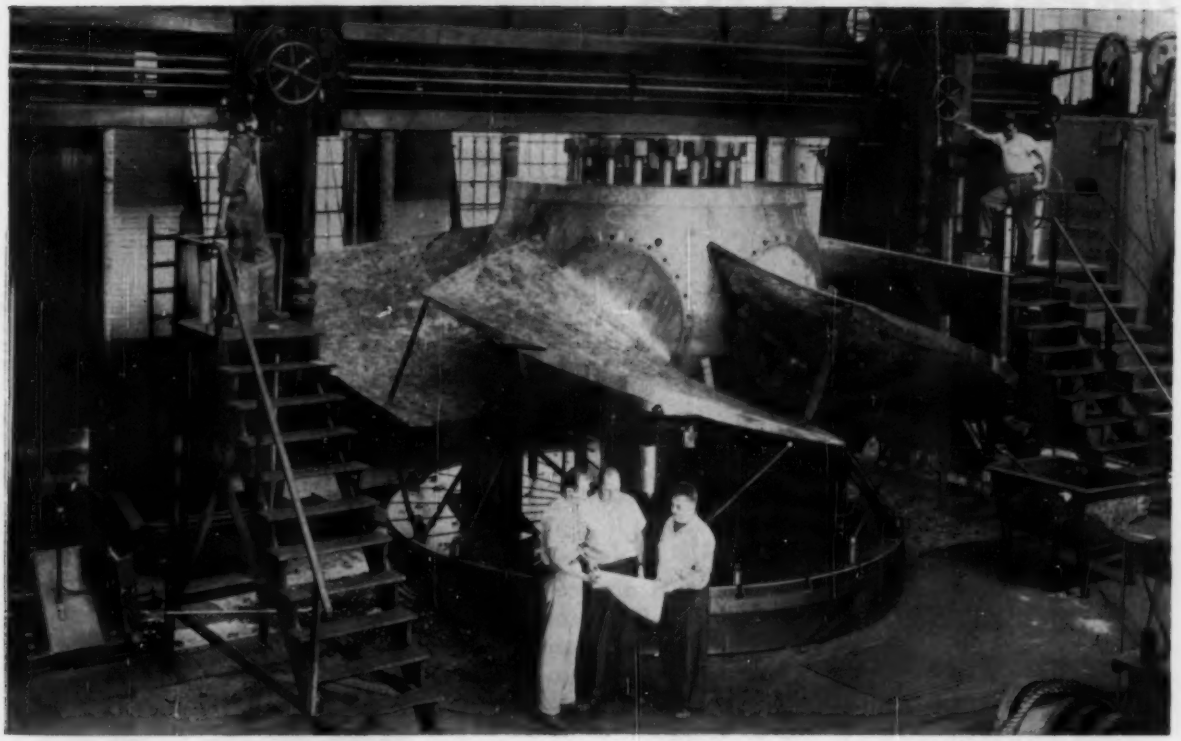
Grades for cutting every material

Eleven grades to choose from: 300 Series and 78 Series carbides for cutting steel; new Grade 860 for cast iron; five grades for nonferrous machining.



. . . in a form for handling every job

Standard tools in thirteen styles, hundreds of sizes; standard blanks in wide range of styles and sizes. Inserts for Carboloy toolholders or other standard types.



AND UNIT COST COMES DOWN, YOUR METALCUTTING JOBS

- Carboloy cemented carbides are tailored to the job
- Let you cut faster without sacrificing tool life

You'll increase the productivity of your machines, while you reduce total manufacturing cost per piece, when Carboloy cemented carbides go to work on your jobs.

Your machines will be more productive, because they can operate at greater speeds and feeds when tooled with the Carboloy grade designed for the job. And they'll produce more per shift, because Carboloy carbides take rugged machining conditions without sacrifice of tool life.

Your units costs will go down, because the use of these grades means less machining time per piece . . . with lower downtime expense, reduced grinding and maintenance charges.

Proved in the field

Hundreds of inplant case histories like the two shown above prove Carboloy cemented carbides can double and triple output, save thousands of dollars per year in machine time, manpower, and tool costs.

The reason is simple. Each Carboloy carbide grade has cutting characteristics tailored to a particular type of job. Whether you're machining ferrous or nonferrous metals, whether you're taking heavy or finishing cuts . . . one of the eleven Carboloy carbide grades handles the job. And you can quickly get the *grade* you need, in the *form* you need it.

Stocked locally by Carboloy Distributors

Your local Authorized Distributor of Carboloy cemented carbide products stocks standard tools, blanks, inserts, and toolholders in styles and sizes for every job or machine. He'll give you fast delivery, and expert technical assistance.

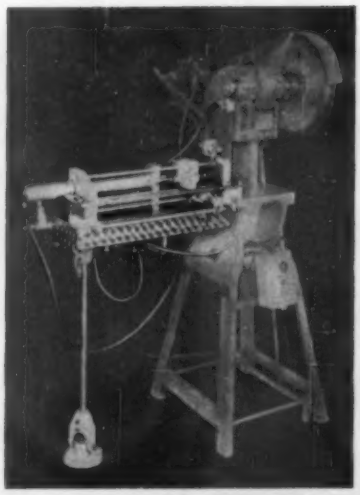
Call him today (you'll find his name in the Yellow Pages of your phone book). Or write: *Metallurgical Products Department of General Electric Company, 11149 E. 8 Mile Street, Detroit 32, Michigan.*

CARBOLOY®
CEMENTED CARBIDES

GENERAL ELECTRIC

IMPROVE YOUR PRESS-ROOM PRODUCTION WITH THESE

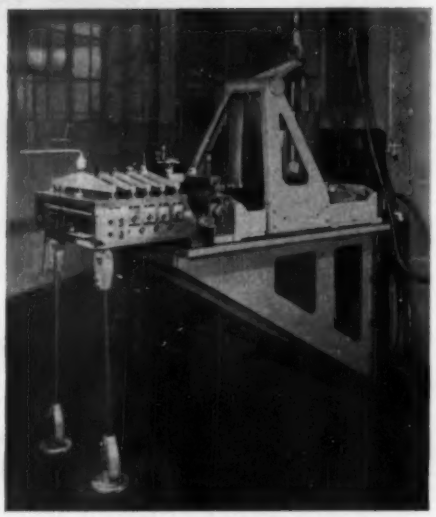
U S PRODUCTS ★



Left: ASF-12 U. S. Air-Operated Slide Feed used in conjunction with small OBI Press. On light work requiring long pitch or feed length, this type of Feed can be used with presses much smaller than would ordinarily be required.

Gain all the advantages from the use of coil stock in your Press Room by arranging your presses with automatic equipment. The illustrations show just a few of the many units included in the line of U. S. Automatic Press Room Equipment designed and built to aid you to reduce costs and increase production. Every operation eliminated will increase your profit potential and place you in a more favorable position in today's competitive market.

Investigate! Ask for copies of Bulletins 80-A and 95-A.



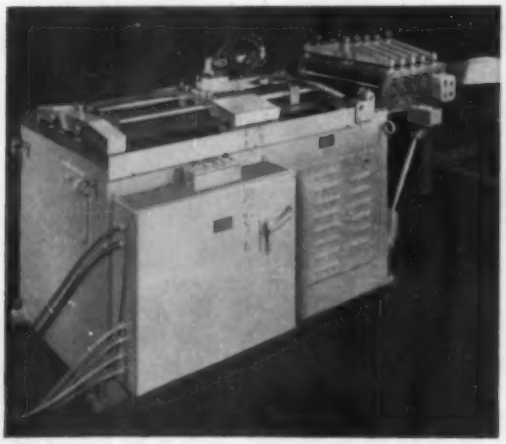
Above: SF-24-24 U. S. Slide Feed equipped with Plain Straightener mounted on Straight Side Press. Capacity for material up to 24" in width, feed length adjustable up to 24" per stroke. Same type of Feed made in smaller sizes.

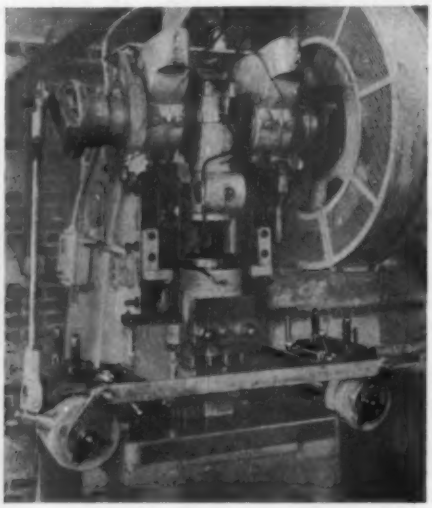
U. S. TOOL COMPANY, INC.

Ampere (East Orange) New Jersey

★ **U. S. PRODUCTS** — Slide Feeds — Roll Feeds — Plain and Power Driven Straighteners — Plain and Power Driven Stock Reels — Coil Cradles — Combination Cradles and Straighteners — Stock Oilers and Wipers — Scrap Choppers — Die Sets — Multi-Slides® — Multi-Millers®

Below: SFC-24-24 U. S. Cabinet-Mounted Motor-Driven Slide Feed equipped with Plain Straightener. Capacity for material up to 24" in width, feed length adjustable up to 24" at one stroke. Equipped with counter to permit multiple stroking to obtain longer lengths.



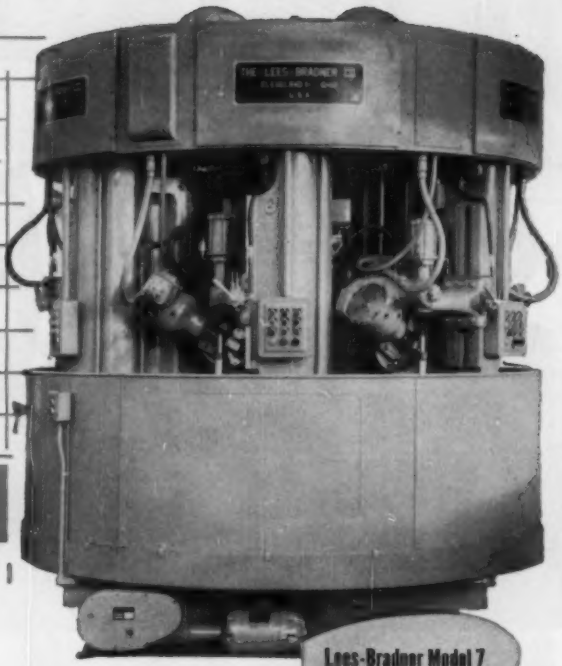


Left: U. S. Double Roll Feed (push-pull type) mounted on conventional OBI Press. Direction of feed can be either right to left or left to right. Made in range of sizes.

LEES-BRADNER

Sets the HOBBING pace for tomorrow

with 6 machines in 1



Lees-Bradner Model 7 HD 8" x 20" 6-Spindle Rotary Hobber. Also available in single and 4-spindle models.

Here's a complete hobbing production line in one space-saving unit. Actually the Lees-Bradner Model 7, HD 6-Spindle Hobber is six separate and independently operative machines in one. Each hobbing unit incorporates basically the same automatic, high-production features as the remarkable 7 HD Single Spindle Hobber. This includes a heavier, more rugged headstock, heavy-duty column and a 10 H. P. motor.

This amazingly efficient machine not only saves valuable floor space but, with its pushbutton controls and automatic features, actually controls the operator thus reducing the chance for human error or slow-down. Chips and coolant are easily carried away from the headstock by the elimination of flat surfaces.

So, if your manufacturing space is valuable and high unit production important, ask your Lees-Bradner representative to give you the story on the ultra-efficient 6-spindle rotary hobber. Write or wire us direct for his name and address in your area.

View of new HD headstock with increased bearing surface between column and headstock, heavier casting, coolant and chip carry-away.

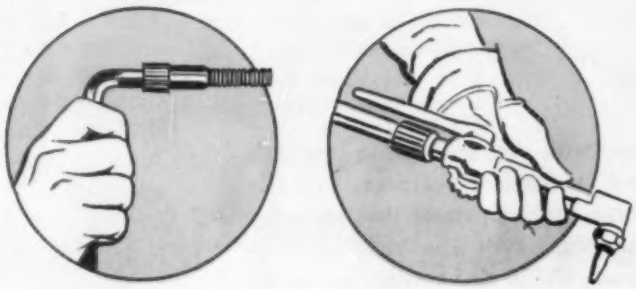
8-Spindle 7-A Rotary Hobbers also available.

IF YOU THREAD OR HOB . . . GET A BETTER JOB WITH A LEES-BRADNER

the LEES-BRADNER Company

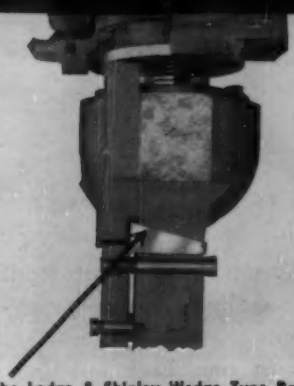
CLEVELAND 11, OHIO, U.S.A.

. . . . quickly, easily released with exclusive patented LODGE & SHIPLEY *WEDGE TYPE RAM PRESSURE RELEASE*



THIS . . . NOT THIS!

- **Use wrench . . . . . not a cutting torch**
- **in minutes . . . . . instead of hours**
- **without damage . . . . die holder destroyed**



The Lodge & Shipley Wedge Type Ram Pressure Release is unusually simple and rugged in design. A heavy steel wedge has a top angle that complements a similar angle on the base of the ram pittman socket housing. Held securely by a heavy steel plate, the wedges can be released quickly to provide up to ¼" additional clearance.

When a press brake is stalled due to improperly adjusted dies . . . do you face a short delay or near disaster?

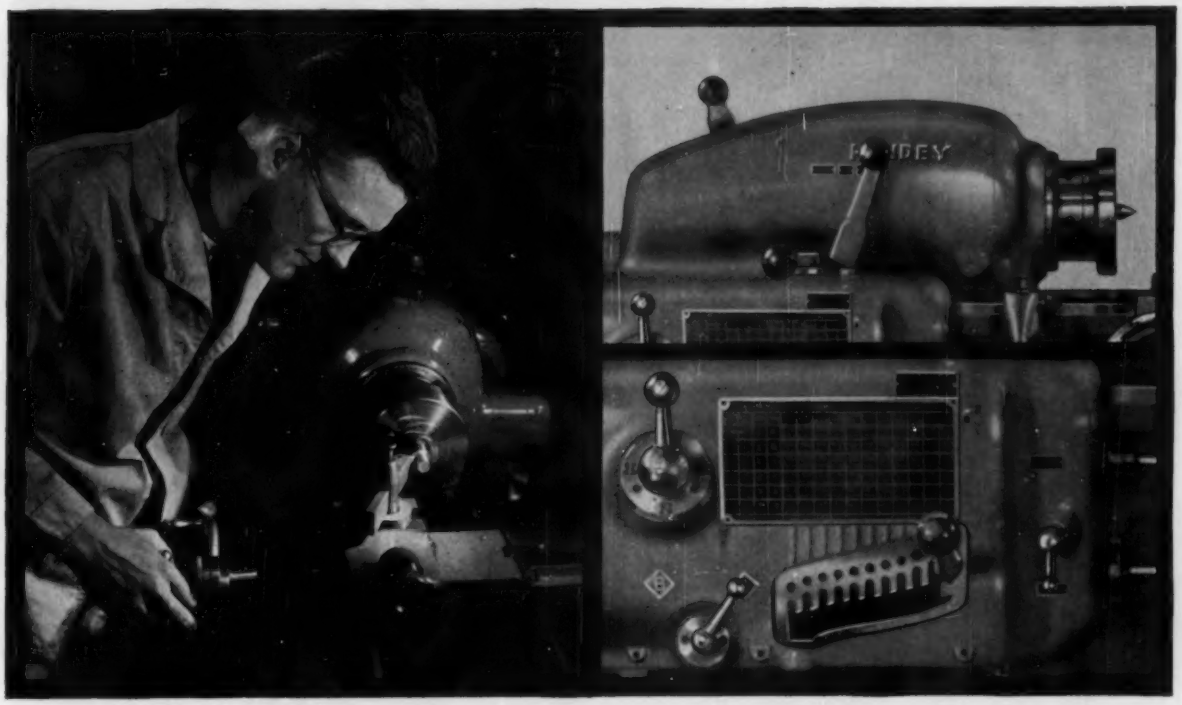
With a Lodge & Shipley Press Brake, release of the stuck dies is a quick, simple, non-destructive matter as described in the accompanying detail.

This is but one of many outstanding Lodge & Shipley Press Brake features designed for fast, accurate, efficient and dependable press brake operation. New literature gives complete details. Write: **The Lodge & Shipley Co., 3056 Colerain Ave., Cincinnati 25, Ohio.**

Lodge & Shipley . . . *your Lodge-ical choice*

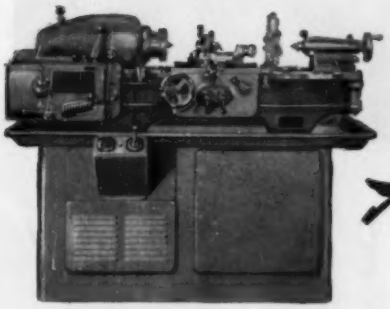
More features per dollar
than any other lathe
in its class!

Hendey 9" tool and gage-makers' lathe



High-speed, precision machining like the job above is backed up by Hendey features — like precision, antifriction bearings at both ends of spindle (upper right), and quick-change gearbox (lower right) for 66 changes of threads.

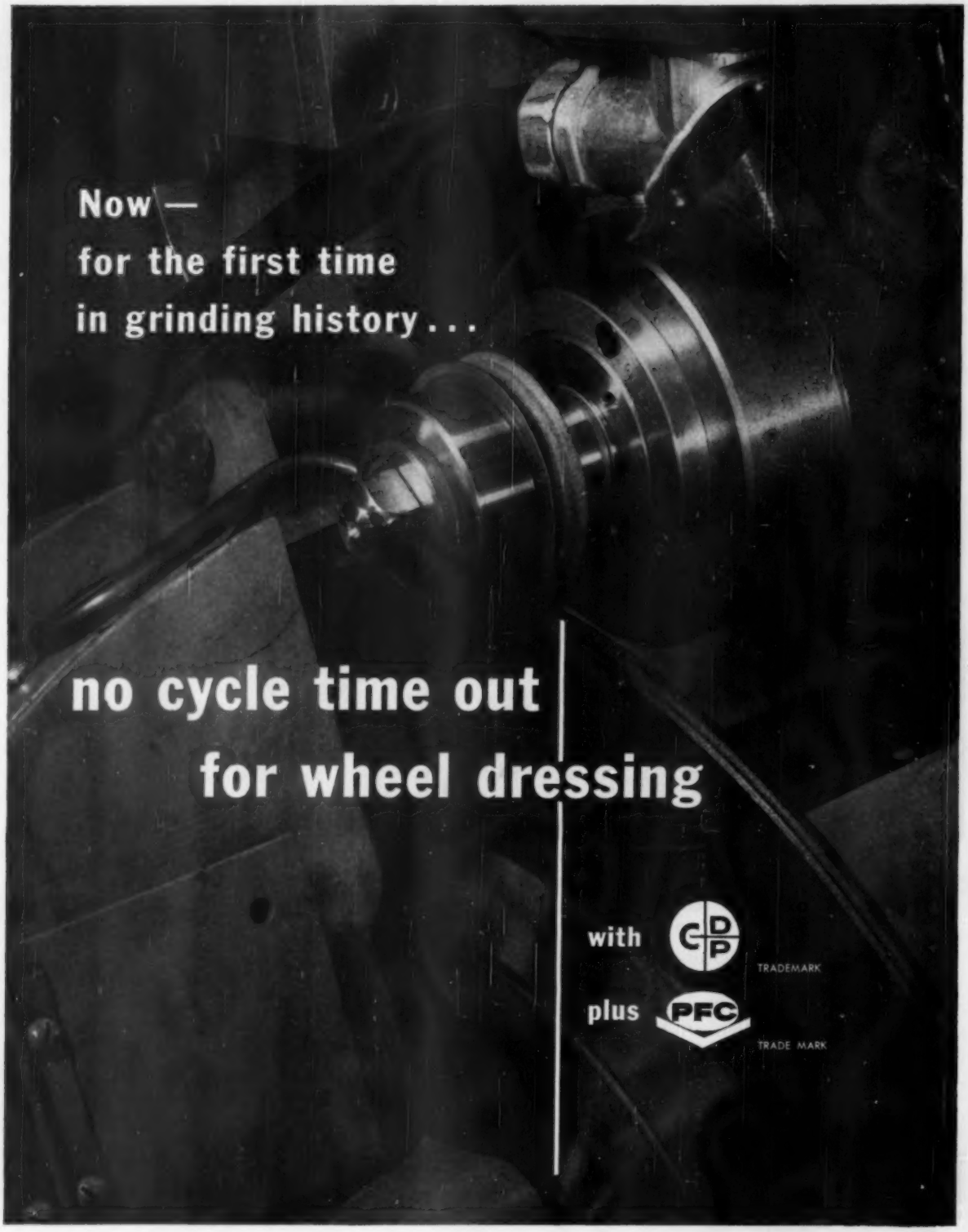
Infinitely adjustable spindle speeds from 15 to 3000 rpm — adequate speed for best results with carbide tools — both are yours with the magnetic amplifier drive on the Hendey 9 in. x 24 in. toolmakers' lathe. Geared feeds are from .002 in. to .120 in. per revolution of the spindle while belt-driven feeds range from .001 in. to .060 in. Every detail is designed for toolroom accuracy and long, trouble-free operation — yet the cost is below that of conventional machines. Ask your Hendey dealer about complete facts and features!



for precision with production, buy Hendey

Hendey **machine division**
BARBER-COLMAN COMPANY
71 Loomis St., Rockford, Illinois

BARBER COLMAN



Write for complete information

JONES & LAMSON MACHINE COMPANY

502 CLINTON STREET, SPRINGFIELD, VERMONT, U. S. A.

Rugged!

Complete line stocked by
the Standard Tool Distributor in your area

STANDARD DOUBLE-END MILLS offer rugged "built-in" resistance to "side thrust".

Whether cupped-end or gashed-end... there is a "Standard" End Mill to fit every need.

Assure top production and economy ... specify STANDARD.

Quality Tools Since 1881

STANDARD TOOL CO.

3950 CHESTER AVENUE CLEVELAND 14, OHIO

FACTORY BRANCHES IN: NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

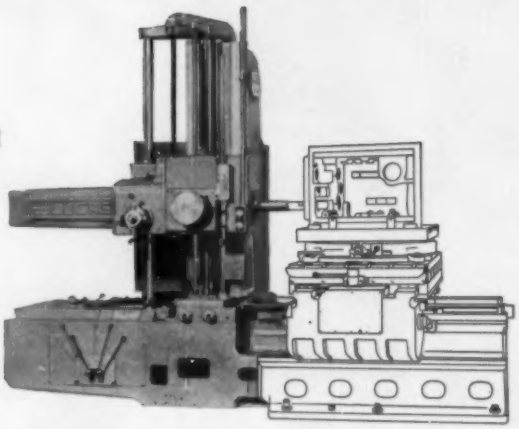
THE STANDARD LINE: *Twist Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Carbide Tools · Gages*

Select a Lucas

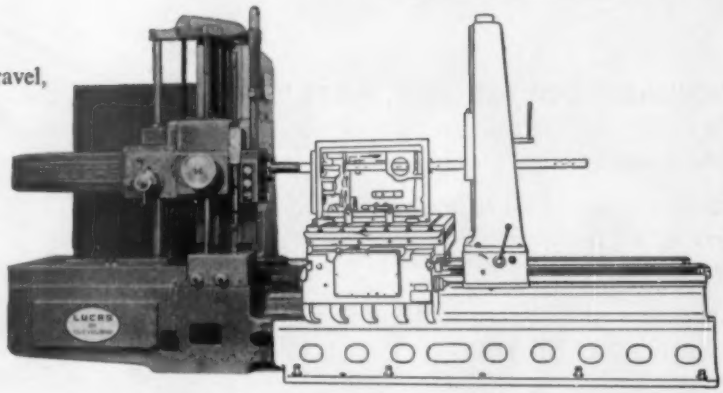
- for accurate spacing
- for precision boring
- for heavy milling

Your choice of controls—

STANDARD LEVER CONTROLS
available for use with both short bed or backrest models.



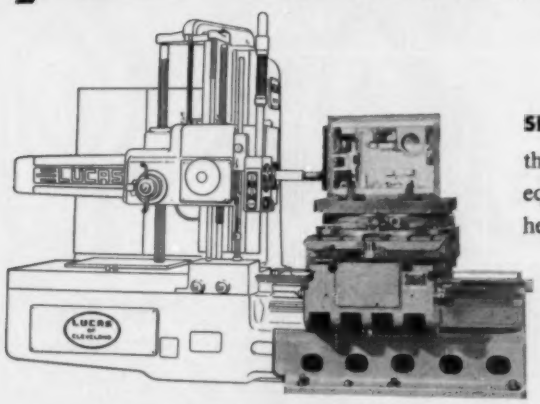
FULL PENDANT CONTROL
of feeds, speeds and directional travel, optional on any Lucas.



Whether you do line or stub boring, whether you prefer lever or automatic pendant control, you get the basic advantages of automatic power positioning and 4-way beds. Whichever model you select you get the benefit of continuing design improvement, backed by 57 years of specialization and leadership in this field *plus* the full resources of The New Britain Machine Company.

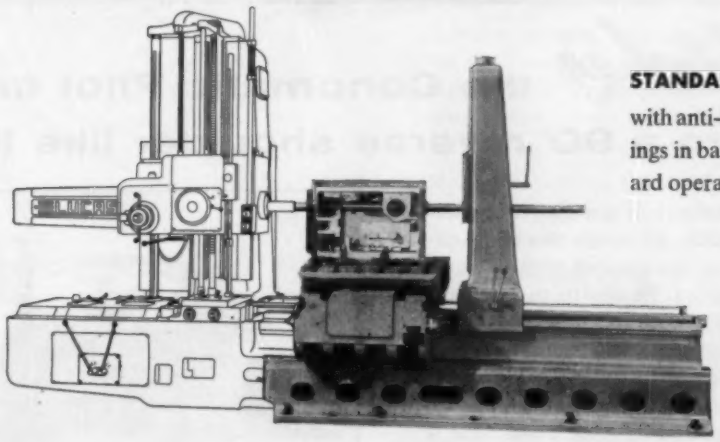
in production
in the tool room
in experimental work
in engineering research
in maintenance applications
or several, in combination

your choice of beds



SHORT BED MODELS

the most compact and economical equipment for precision stub boring, heavy milling and horizontal drilling.



STANDARD BED WITH BACKREST

with anti-friction bearing mounted bushings in backrest block, handles all standard operations including line boring.

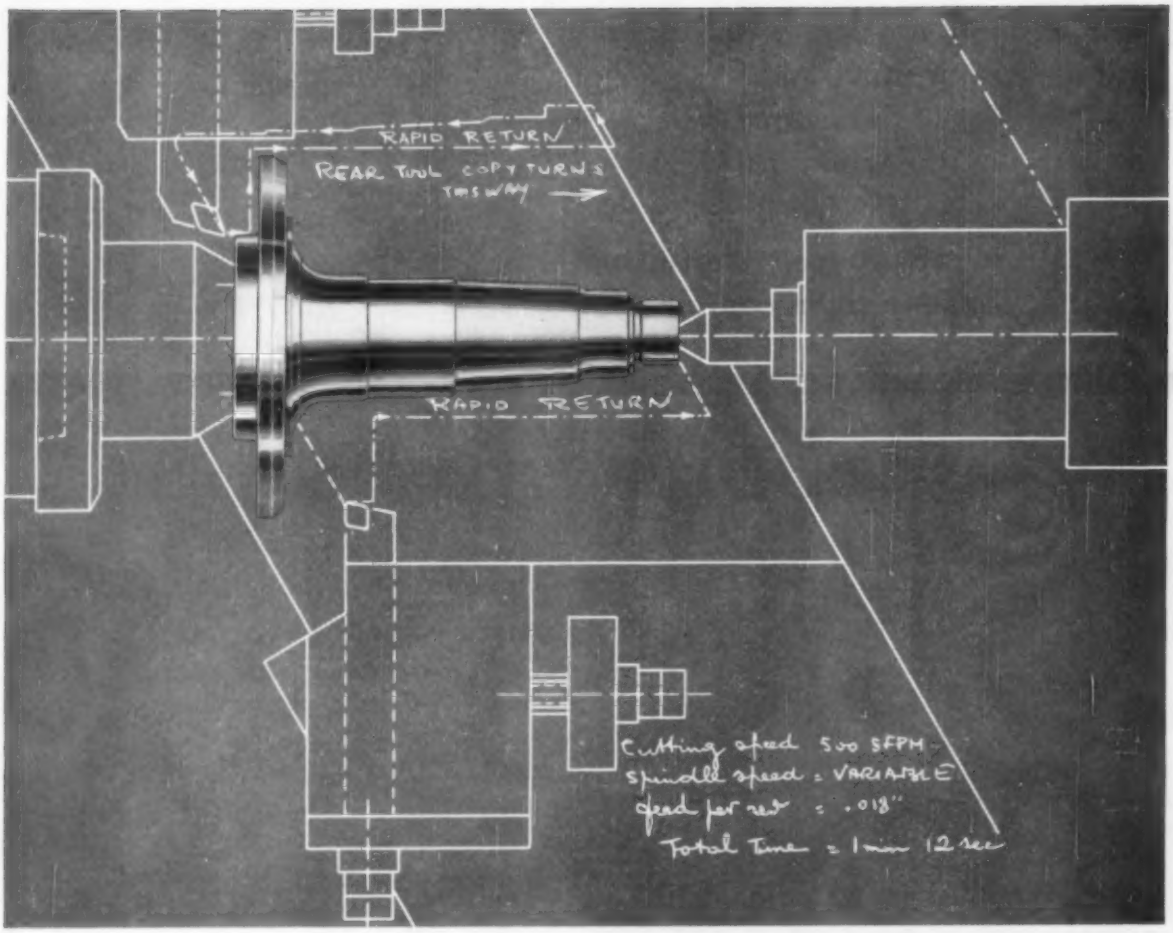
LUCAS OF CLEVELAND

LUCAS MACHINE DIVISION
The New Britain Machine Company
Cleveland, Ohio

OTHER NEW BRITAIN MACHINE TOOLS DIVISIONS

New Britain-Gridley Machine Division
New Britain, Connecticut

Hoern & Dilts Division
Saginaw, Michigan

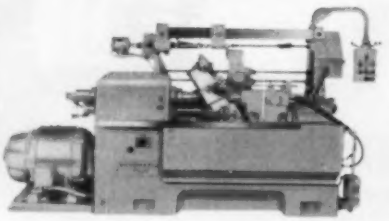

RAPID RETURN
REAR TOOL COPY TURNS THIS WAY
RAPID RETURN
Cutting speed 500 SFPM
Spindle speed = VARIABLE
feed per rev = .018"
Total Time = 1 min 12 sec

Without special tooling the Conomatic Pilot can copyturn a 90° reverse shoulder like this

With the Conomatic Pilot copying lathe, you can copyturn a 90° reverse shoulder with a single cross slide. Although this hydraulically-controlled multicycling lathe can be equipped with as many as two infeed slides and two cross slides, its ability to copyturn in reverse often makes costly special tooling unnecessary.

For example, the 90° reverse shoulder on the automatic transmission part shown above is copyturned in reverse by the rear tool on the 60° cross slide when the lathe's motorized template indexes after the front tool has completed its pass. Total time is 1 minute 12 seconds, with a gross production of 50 pieces per hour.

Write us today for a brochure giving details and specifications of the Conomatic Pilot—the world's most versatile copying lathe.



The Conomatic Pilot Model KU: A hydraulically-controlled multicycling copying lathe with piloted hydraulic feed that provides constant feed per revolution. Motorized rotating template provides up to four passes and four rapid returns or four additional passes in reverse. Adapted to completely automated loading and unloading.

Conomatic

CONE AUTOMATIC MACHINE CO., INC., WINDSOR, VT.

PILOT DIVISION

30 Rockefeller Plaza, New York 20, N. Y.

Working with foreman Bill Todd (right) of Whitin Machine Works, Whitinsville, Mass., Bay State distributor, Vic Ericson (left) of Johnson deVou, Worcester, Mass., helped cut Whitin's grinding costs thousands of dollars per year.

They made 1 wheel do the work of 12

Centerless grinders at Whitin Machine Works were handling parts ⅛" to 5" diameter in bronze, brass, aluminum, cast iron, Meehanite and various steels. Short runs averaged between 3 and 300 pieces. With a dozen different wheels in use, the opportunities for savings on wheel changes alone are tremendous.

Department foreman Bill Todd wanted to simplify. He was looking for *a single all-purpose wheel that would eliminate all wheel changes due to varying job requirements.*

For a while it looked as though he was asking the impossible. But Bay State distributor Vic Erickson went to work with the sales engineering staff at Westboro and came up with a solution . . . a single wheel that handles the entire range of sizes and metals with only one dressing an hour. Finishes average #16RMS . . . go as fine as #2 with special care.

Whatever your company's abrasive problems may be, you'll find Bay State representatives ready to help and competent to work out practical solutions.

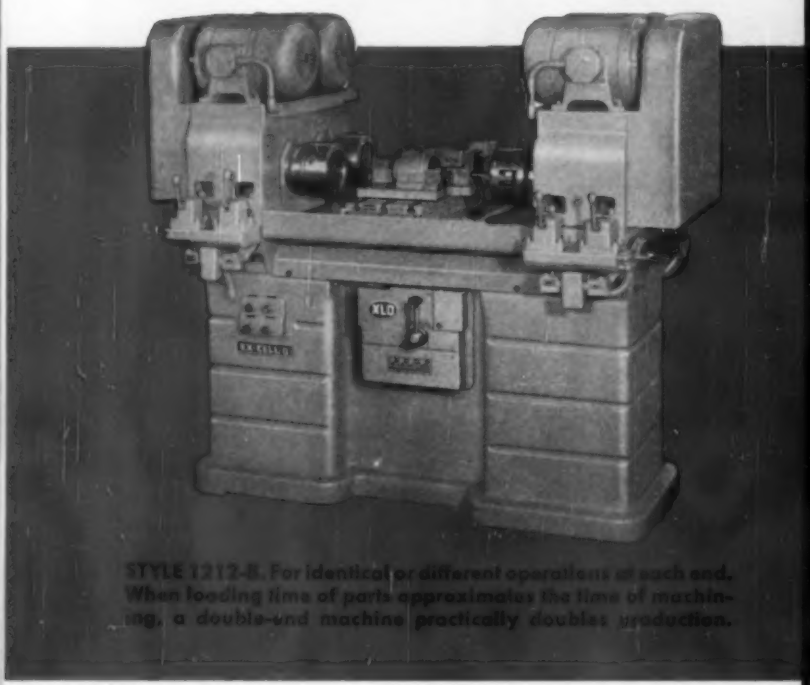
BAY STATE WHEELS of PROGRESS

BAY STATE ABRASIVES

Bay State Abrasive Products Co., Westboro, Mass.
Branch Offices and Warehouses: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh.
Distributors: All principal cities, Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ontario.

Maximum Production Speeds at Low Cost

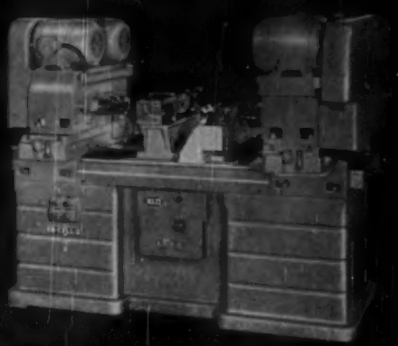
WITH EX-CELL-O PRECISION BORING MACHINES



STYLE 1212-B. For identical or different operations at each end. When loading time of parts approximates the time of machining, a double-end machine practically doubles production.

STYLE 2112-B. Single-end model for work pieces in the small and medium-size range. Flexible hydraulic controls give easy adjustment of work cycle.

STYLE 112-D. Large and sturdy with long stroke. Accommodates medium and heavy work, gives maximum precision production, minimum operating cost.



STYLE 17-A. Massive construction. Maintains the highest precision standards on a profitable production basis. Economical in operation, can be tooled for a wide range of production jobs.

These versatile Ex-Cell-O Precision Boring Machines bore, turn, face, counterbore, chamfer and groove.

Whichever model fits your production requirements, you'll find this large variety of precision operations will lower your costs—increase your profits.

All Standard Ex-Cell-O Precision Boring Machines can be equipped for work handling and ejecting operations, thus providing fast, automatic production at minimum cost.

Contact your local Ex-Cell-O representative who will provide all the facts about these machines, or write to Ex-Cell-O for a precision boring catalog.

57-3

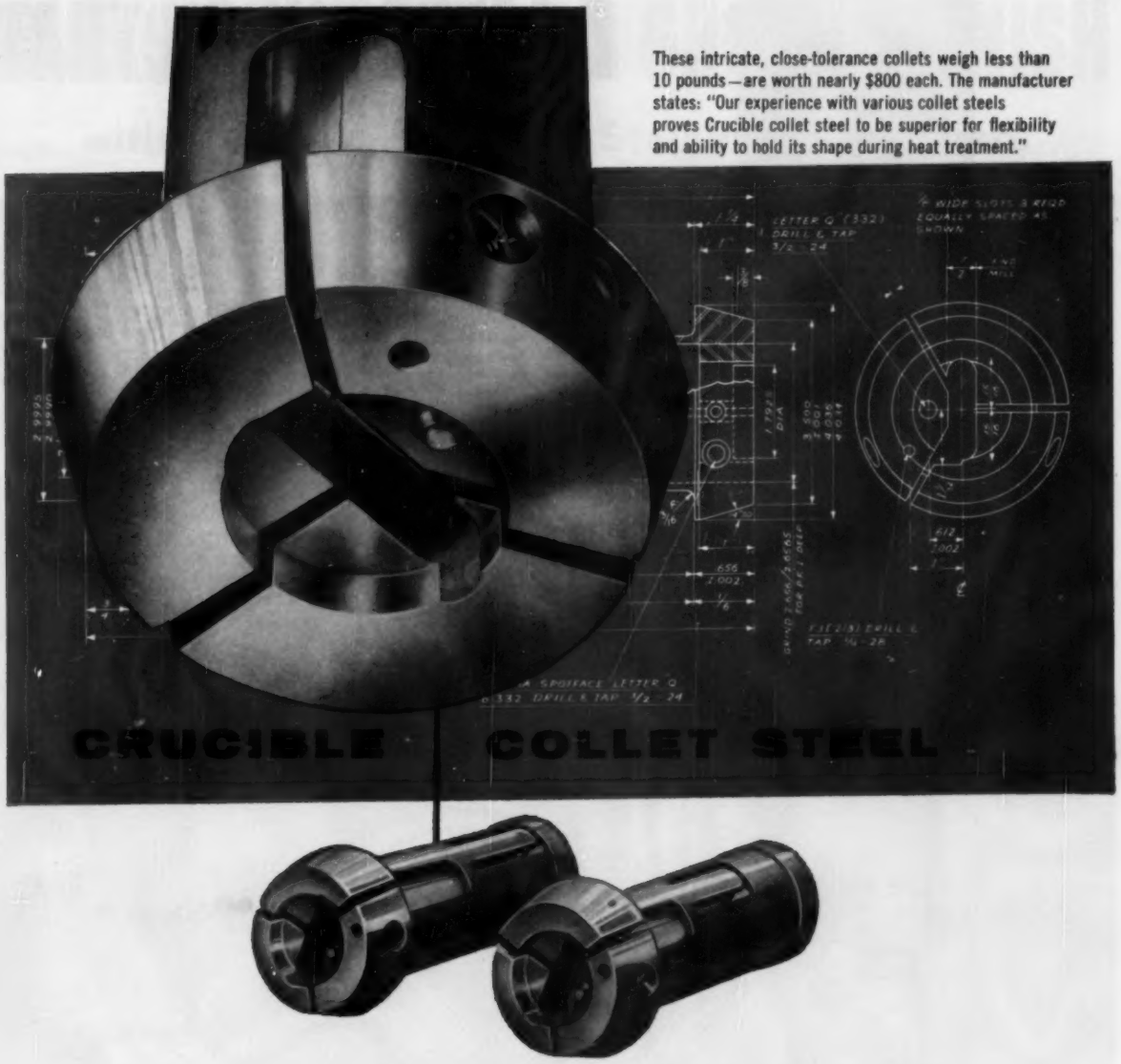
XLD

EX-CELL-O FOR PRECISION

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT



These intricate, close-tolerance collets weigh less than 10 pounds—are worth nearly $800 each. The manufacturer states: "Our experience with various collet steels proves Crucible collet steel to be superior for flexibility and ability to hold its shape during heat treatment."

for minimum distortion after heat treatment

These collets are used in machining the anchoring end of jet engine turbine blades, while locating the part from reference points on the airfoil section of the blade. It's a job that demands a steel which will not distort during heat treatment. The collet head is heated to Rockwell 58-60 C—the body tempered to 35-38 C.

The steel used is a special Crucible non-warping alloy collet grade. The collet manufacturer, Balas Collet Mfg. Co., Cleveland, Ohio, reports: *The extreme accuracy built into these collets while they are still in the soft state shows less than .0005" distortion on any dimension after heat treatment.*

Crucible collet steel was developed specifically for spring collets—or *any* parts with rigid requirements of excellent machinability and high attainable hardness. Other properties—in almost limitless combination—can be had in other Crucible alloy grades. To see what information is available on these alloy steels—or *any* Crucible special steel—get your copy of the *Crucible Publication Catalog.* Write *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

A LATHE FINISH THAT

Economically machined stainless steel aircraft seal, made by Sealol, overcomes shaft wear, prevents leakage. ENDURO's corrosion-resistance permits Sealol to make "factory fresh" delivery of parts to customers without need for protective rust inhibitor.
Stainless steel's outstanding corrosion resistance helps Sealol-Flexibox Pump Seals operate at 100% efficiency for long periods of time. ENDURO meets the demand for both fabrication and performance in these critical parts.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

LOOKS AS GOOD AS A GROUND FINISH

with Republic ENDURO Stainless Steel Bars

That's the performance report from machine operators at Sealol Corporation, Providence, Rhode Island. The company uses Free-Machining ENDURO® bars in the manufacture of mechanical shaft seals for application on fuel tankers, and in the food, chemical, aircraft, and petroleum industries.

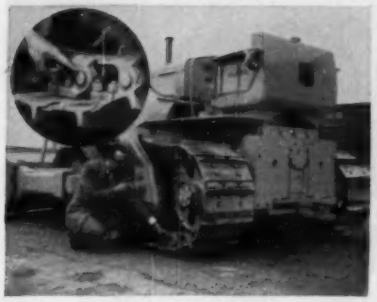
Sealol machine operators like the machinability of ENDURO Stainless Steel Bars. They like the fine surface finish obtainable, the accuracy of section, the uniform soundness, and the ability of ENDURO to hold close tolerances.

These advantages of Free-Machining ENDURO Bars provide Sealol with machinability at a cost that permits them to be competitive. Economies result from reduced scrap loss and elimination of re-working of parts. Pride of workmanship is maintained at a high level.

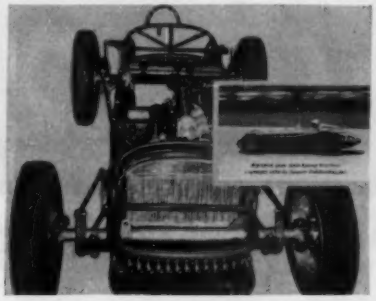
If you machine stainless steel parts, you'll like working with ENDURO. Here is a metal unsurpassed in high physical strength and chemical properties to which have been added the advantages provided by cold finishing. Two grades, A.I.S.I. Types 416 and 430-F, are fully 90% as machinable as Bessemer screw stock.

In addition to a complete range of analysis in cold finished form, Republic also supplies ENDURO in hot rolled bars, special sections, and wire. Republic metallurgists and machining specialists will give you expert, obligation-free assistance on application, processing, and use.

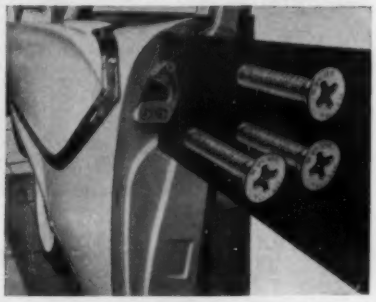
FREE BOOK—"How to Machine ENDURO Stainless Steel Bars". This 96-page, pocket-sized manual was planned and written to help you obtain the best possible results when machining ENDURO bars. Send coupon for your copy.



EXCELLENT MACHINABILITY, straightness, smooth surface, and accurate size of Republic Cold Finished Carbon Corrected Steel Bars provide production economies at Oliver Corporation. Used for track pins in the "OC-18" Crawler Tractor, this material has proved to be exceptionally resistant to fatigue failure, and able to absorb the shocks and wear of the most rugged service. Cold finishing improves ultimate strength, yield point, and hardness. Carbon correction saves money by restoring to the surface carbon lost in hot rolling, and by eliminating the need for removal of this low carbon surface.



FABRICATING AND MACHINING ECONOMIES can often be effected with Republic ELECTRUNITE®, the *original* electric resistance welded tube. Steel tubing is used for the body frame of this racer to obtain maximum strength at reduced weight. At any given weight, tubing is the strongest of all mechanical shapes. Dollar for dollar, ELECTRUNITE is the most economical. It is consistently uniform, including wall thickness, ductility, and concentricity. Surfaces are free from scratches and pit marks. It is easy to bend and work—responds uniformly to heat treatment. Send coupon for facts.



FINISHED ASSEMBLIES subject to impact and vibration are held in a positive, vibration-proof grip with Republic Nylok® Bolts. That's why they were selected by Ford engineers to anchor the striker plate to door post. Grip is produced through compression of a small nylon pellet imbedded in body bolt. When unit is wrenched into a threaded hole, the pellet exerts a continuous, powerful lateral thrust, forcing a strong metal-to-metal lock between opposite mating threads. Lock is positive, whether or not bolt is seated. There's no galling of threads or seating surfaces. Nylok Bolts can be hand or power wrenched.

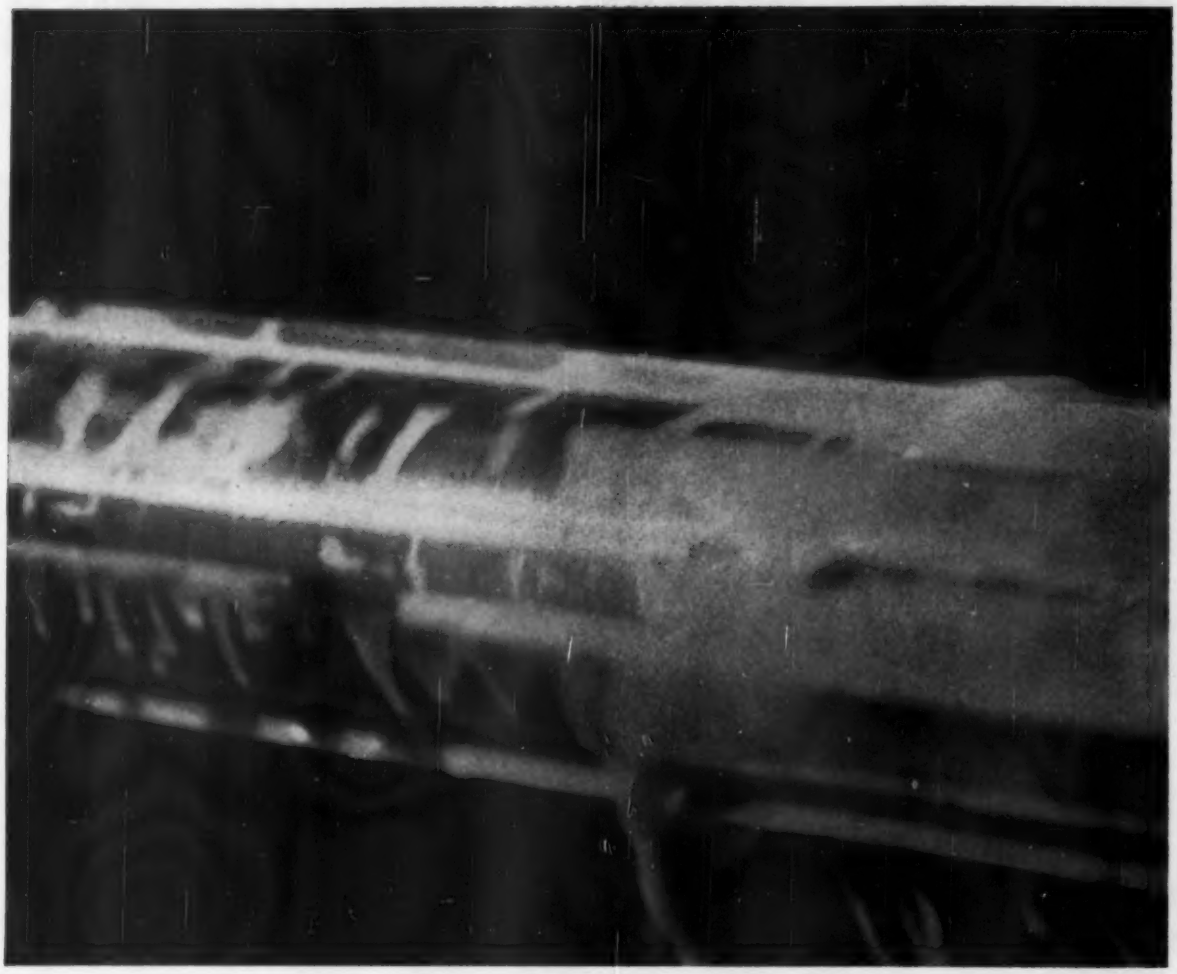
STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. C-4256
3102 EAST 45TH STREET • CLEVELAND 27, OHIO

Send____copies of "How to Machine ENDURO Stainless Steel Bars". Send more information on:
☐ Cold Finished Carbon Corrected Bars
☐ ELECTRUNITE Steel Tubing
☐ Nylok Bolts

Name_____ Title_____
Company_____
Address_____
City_____ Zone____ State_____



He Socked That Bit in

There's always
a way to get
more work
out of the
machines you
have . . .
and here's
an example.

It was kind of a "put up or shut up" demonstration. The Houghton Man told us we could cut metal faster with his ANTISEP All Purpose Base than with the cutting fluid we were using. We told him to prove it.

He did. With all of us in the shop watching, he had the machine set up (it was one of the oldest we have) and then fed that bit into the work faster than any of us had ever dared.

We all wondered what would break first, but nothing broke. We were convinced.

The higher speeds and faster feeds ANTISEP Base makes possible can boost production in your shop just as easily. And you'll get other benefits. ANTISEP is economical to use because you mix it 1:25 with water. Its cost—in the machine—is low.

Work is protected from rust by a powerful preventive mixed right into ANTISEP Base. And ANTISEP doesn't smoke, won't let chips build up, won't turn rancid.

Finishes are top-grade, even with the heaviest feeds, because ANTISEP cools as no oil can.

ANTISEP All Purpose Base is the heavy-duty member of a whole Houghton family of superior cutting oils and bases. Ask the Houghton Man about them today.

so Hard it Scared Us

HOUGHTON'S FAMILY OF CUTTING OILS AND BASES:

Cut-Max	Series of fortified ready-to-use cutting oils and concentrated bases for dilution by user.
Antisep All-Purpose Base	Miscible with either water or oil; for 90% of all machining uses.
Antisep Soluble Oil	Antiseptically treated; detergent action; releases grinding dust.
Houghto-Grind 50	Grinding concentrate; stops rust, won't load wheel.
M. M. Honing Oil	Beats kerosene for honing.

ANTISEP BASE

...a product of

E. F. HOUGHTON & CO.

PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service...

CUT KEYWAYS in ONE MINUTE for ONE CENT with the

***Minute Man* KEYWAY BROACH KIT**

Using an arbor press you can cut keyways for as little as a penny a piece in just one minute with the Minute Man Keyway Broach Kit. For keyways from 1/16" to 1" in any bore from 1/4" to 3".

Minute Man Broaches for square and hexagonal holes and Production Type Keyway Broaches are also available from stock from your Industrial Distributor.

SEND FOR CATALOG and PRICE LIST

The duMONT CORP.
Greenfield, Mass.

MAIL FREE BROACH CATALOG AND PRICE LIST A describing Square Broaches, Hexagon Broaches, Production Type Keyway Broaches and Keyway Broach Kits to

Name.....

Company.....

Address.....

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

How do you figure?

Dear Sirs:
In your article, "Modernization Makes a Million" (*AM*—Apr 8 '57, p129, you make the following statements:

"Many people do not realize that a saving of $1-million is equivalent to a tax-free increase in gross sales of better than $20-million. A great number of business men who wouldn't think more than twice about spending $2-million to guarantee an annual business improvement of $20-million would hesitate a long time before spending that kind of money on a program that said 'modernization' instead of 'sales.' Yet, in this and many other cases, modernization brought an equivalent and much more certain return on the investment."

I am very much interested in getting some details as to how you arrived at your conclusions.

H M Wilson
Chicago, Ill

The conclusions were based on an assumed 5% profit after taxes. Thus, by spending $2-million on improvement, American Bosch is saving something over $1-million per year on manufacturing costs. This saving is equivalent to the profit the firm would earn on an additional $20-million of business. There is some question whether the profit is always tax-free as quoted in the first sentence—Ed.

Management Team

Dear Sirs:
I have just read with great interest your editorial about the foreman's position on "The Management Team," (*AM*—June 3 '57, p95). It states in few and simple words an important problem facing both foremen and executive management. However, there is much more to say on the subject.

The writer does not claim to be an expert on the subject, but my comments are based on over thirty years experience as a foreman in free-enterprise industry and on my observations as a member of the Foreman's Club of Greater Cleveland, which is affiliated with the National Management Association.

It has always been my belief

SHOPMATES

N. Jarvis

JUST TO PROVE THAT ULCERS ARE MADE, NOT BORN--- WHAT ALWAYS HAPPENS WHEN YOU'VE WAITED FOR WEEKS FOR SPECIAL STOCK FOR A VERY SPECIAL JOB??
I DON'T CARE HOW FAR BEHIND SCHEDULE YOU ARE --- HOLD HIM FREE TO START THAT SPECIAL JOB THE INSTANT THE STOCK GETS HERE !!
NEVER MIND THAT SPECIAL JOB NOW--- HERE --- WE NEED THESE PARTS--- IMPERATIVE --- WORK OVERTIME --- FAST FAST ---
YOU FIND THAT YOU'VE HAD AN EXTRA SPECIAL JOB HANGING AROUND ALL THE DARN TIME--- THATS WHAT ALWAYS HAPPENS!
H. JARVIS

Designed to do one job in the best possible way.....

LELAND-GIFFORD

Special

DRILLING MACHINES

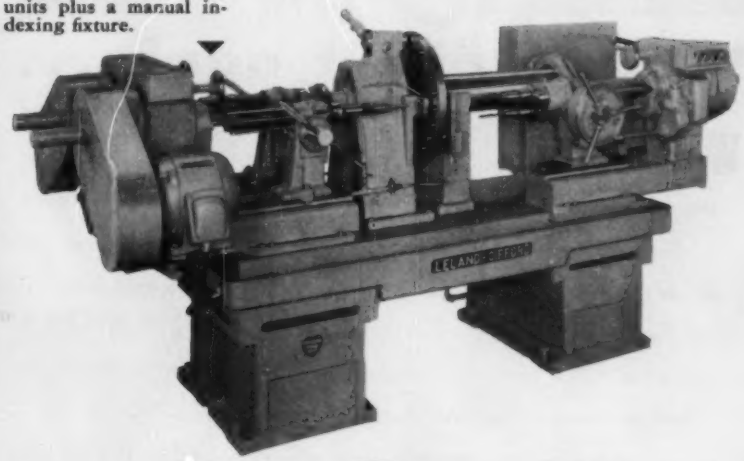
Contact the office nearest you for help with your drilling problems.

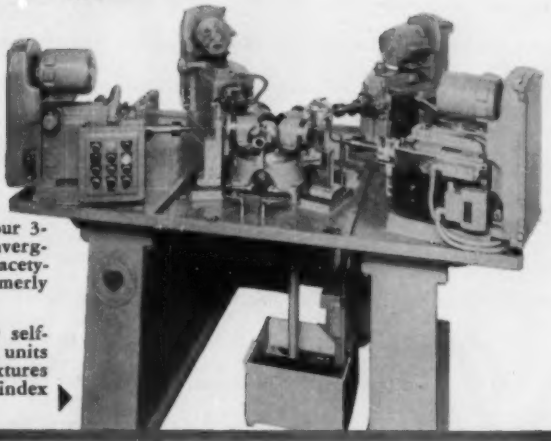
THE JOB — Drill two .630 x 3¾" x 25° holes in 4-cylinder and 6-cylinder crankcases.

THE SETUP — A No. 3 self-contained step feed unit with 2-spindle head, special base cabinet with roller-type fixture, plus angular top column. Ties into conveyor line to eliminate lifting.

THE JOB — Drill and ream 48 holes (tap and countersink 24) in an aircraft turbine shaft.

THE SETUP — Two single (left) and one 2-spindle (right) horizontal V-belt units plus a manual indexing fixture.





THE JOB — Drill four 3-diameter deep converging holes in copper acetylene torch tips. Formerly a hand operation.

THE SETUP — Four self-contained step feed units plus five holding fixtures and a hydraulic index table.

LELAND-GIFFORD
Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.

CHICAGO 45
2515 West Peterson Ave.
DETROIT
10429 West McNichols Rd.
CLEVELAND 22
P.O. Box 853
NEW YORK OFFICE
75 South Orange Ave.
South Orange, N. J.
LOS ANGELES OFFICE
2620 Leonis Blvd.
Vernon 58, Cal.
INDIANAPOLIS 6, P. O. Box 1051
ROCHESTER 12, P. O. Box 24, Charlotte Station

Walker did it again...

When Walker engineers created a Multi-Pole Fine Division Magnetic Chuck* they were convinced that a new milestone in holding had been achieved.

However, the new chuck was not introduced to American industry until complete tests in actual service had been made. Rather than a quick entry into the market, our New England conservatism dictated that every test must be met before the Walker name could be given to this revolutionary holding device.

And so, the new chuck was placed in service not only in America but in Europe, and when it proved everything our engineers claimed for it, it went on the market. Actual service proved our ceramic magnets the most permanent magnetic materials ever produced for a magnetic chuck . . . that we could use the lowest height ever . . . with less than half the weight of former permanent chucks . . . with each pole a separate and independent magnet in itself . . . and, all magnetic fields neutralized to prevent magnetism entering machine table or ways. Not the least of this accomplishment was the established fact that this is the only permanent chuck produced for milling. You can translate these advantages into your own production.

As specialists in magnetic and other work-holding devices, we can safely point with pride to this continuance of the Walker tradition.

*Patent applied for

O. S. WALKER CO., Inc.

WORCESTER • MASSACHUSETTS

that our real objectives should be to secure the kind of cooperation—the kind of teamwork—that will result in getting men to do what they ought to do as management people, with the greatest responsibility for development of the individual himself on his particular job.

While qualified foremen with the right attitudes are finding many opportunites to play on the management team, it is equally true that many good men "are not accorded the recognition due them." We are in complete agreement on this point, and I have no illusions about the matter. There are indeed two sides to every coin. But, what to do about it?

We all know that the only security that any management man can have these days lies within himself. A foreman who does no more than he has to will undoubtedly wind up getting paid for exactly what he does. Without a real willingness and a genuine desire to improve one's position and to develop one's talents, a person cannot be helped by anyone.

Lou Rosenthal
Cleveland, Ohio

We are pleased to have Reader Rosenthal's comments on the subject of management-foreman relations. Of course, no amount of effort on the part of management will make good foremen out of poor material. In addition, there are sometimes cases where there is no outstanding "good" man for a promotion, and management has to make a decision to pick one of a group of apparent equal ability. In such a case, several "good" men

Helpful Henry

by L. Hoppes

"Sometimes you have to give it a hard shovel"

may feel slighted. However, assuming suitable recruits to the lower levels of supervision, a great deal can be done to keep them enthusiastic about their jobs and about their own development by granting them adequate recognition—tangible and intangible. It takes the best efforts of all levels of management to create an effective team—Ed.

Solder Paint

Dear Sirs:
On your Spot News page (*AM*—June 17 '57, p105) you mentioned a new solder paint developed by England's Perdeck Solder Products Ltd. We would like to receive a sample of this material for trial purposes.

Perhaps you may be able to have a sample sent to us, or maybe you can give us their address in England so we can order direct.

A T Harris
Providence, R I

Unfortunately, our records do not indicate that this company has representation here in the United States, so we suggest you write direct to Perdeck Solder Products Ltd, Waltham Abbey, Essex, England—Ed.

Further Identification

Dear Sirs:
I would appreciate knowing the position and background of the individual who wrote the article on cost accounting (*AM*—June 3 '57, p109).

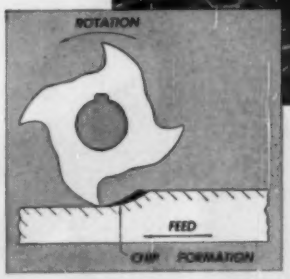
I feel that this was a most instructive and penetrating article, although the views expressed are not universally shared in industry.

F C Baldock
Pittsburgh, Pa

A consultant who has written numerous articles on accounting and engineering, Pilson W Kelly is at present Treasury Services Supervisor of the Ford Instrument Co Div of Sperry-Rand Corp, Long Island City, N Y. The company name was omitted when the article was printed, because Mr Kelly wished to emphasize that the views evpressed were his own and not necessarily those of the Ford Instrument Co—Ed.

Brown & Sharpe CHIPS

How Cutter Chips Prove Milling Efficiency!



In conventional (up) milling, work is fed against direction of cutter rotation. Chip is thin at initial engagement of tooth, reaches maximum thickness at point where tooth ends upward travel through work-piece.

High Speed Steel Cutters... Key to Economy

Long, unbroken chips prove that the Brown & Sharpe helical plain milling cutter is the right one for the job. An incorrectly designed cutter causes broken, uneven chips, a rough surface finish.

Correct rake angle is very important for superior finish . . . rapid machining with less power . . . increased cutter life. Every Brown & Sharpe PRODUCTIONEERED Cutter is designed with the rake angle found best for fast, economical milling.

There's a big difference between *price* and *cost* of high speed steel cutters. *True Cutter cost* is measured by how many accurate, uniform pieces are produced—at optimum speed—before the cutter requires resharpening. For maximum production, minimum cost, specify Brown & Sharpe PRODUCTIONEERED Cutters!

Write for 80 page Brown & Sharpe Catalog showing over 2300 High Speed Steel Tools and Accessories.

BUY THROUGH YOUR LOCAL DISTRIBUTOR

Brown & Sharpe

BROWN & SHARPE MFG. CO. • PROVIDENCE 1, RHODE ISLAND

STOCK OF OVER 3000 STANDARD TOOLS!
Obtain impartial High Speed Steel, Carbide and Carbide Tipped tooling recommendations from your Brown & Sharpe—NELCO Distributor.

In tough mining equipment . . .

WELDABILITY OF USS "T-1" STEEL

EVEN A HALF HOUR of down time on a big stripping shovel like this one is extremely expensive. So the owner, Tasa Coal Company, uses USS "T-1" Steel extensively to increase service life. Tasa has experienced no failures of USS "T-1" Steel even when it takes hard daily pounding at below-zero temperatures.

PAYS OFF IN BUCKET REPAIR

THE ORIGINAL BUCKET on Tasa Coal Company's 18-cu.-yd. stripping shovel was badly worn. The culprit, of course, was tens of thousands of tons of rock and dirt. So when new-bucket time came around, Tasa felt they could increase service life by building the new bucket in their own repair shop from tough, strong USS "T-1" Steel plate. Results have been excellent!

NO FABRICATING PROBLEM

The shop foreman told us that he had no difficulty welding USS "T-1" Steel. The welds have held up extremely well. After weeks of prolonged, hard service in sub-zero temperatures they show no signs of cracks.

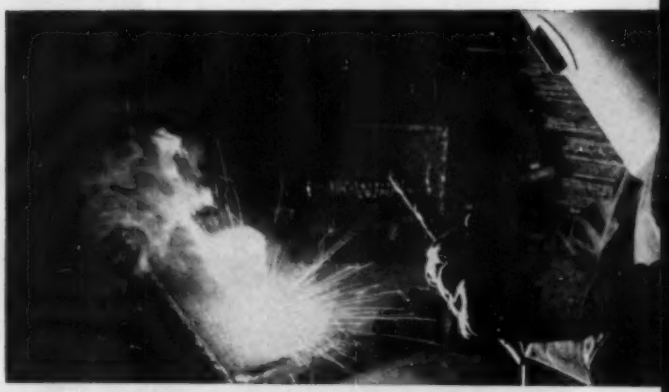
OTHER APPLICATIONS

Tasa Coal Company has had good success fabricating USS "T-1" Steel for other parts, too. They weld ¾-inch USS "T-1" Steel plates, quenched and tempered to 321 minimum Brinell, to bucket teeth and thereby *triple* service life—increase it from just 5 days to 15 days.

USS "T-1" Steel has found a home in many mining applications. Its weldability and formability facilitate fabrication, while its very high yield strength of 90,000 psi and its amazing toughness and resistance to impact-abrasion help to reduce weight or increase durability.

WRITE FOR NEW TECHNICAL BULLETIN

Our new booklet, called "T-1," gives you much useful information on fabrication procedures and possible uses for this versatile alloy steel. Write for it today!



WELDING USS "T-1" STEEL plates to worn, cast bucket teeth. "T-1" Steel has *tripled* life of the teeth.

AUGER CUTTER HEADS get battered and abraded in really hard service. This entire head, except teeth and holders, was rebuilt by Tasa Coal Company with USS "T-1" Steel to insure good service life and to minimize repairs and maintenance.

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

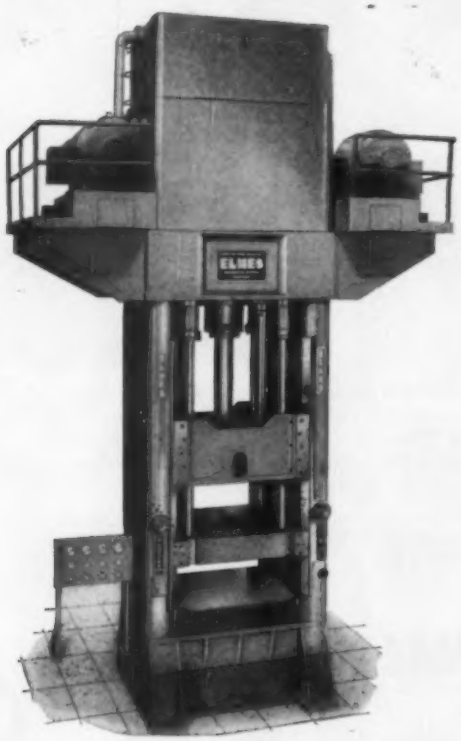
USS "T-1" CONSTRUCTIONAL ALLOY STEEL

"USS" and "T-1" are registered trademarks

Watch the **United States Steel Hour** on TV every other Wednesday (10 p.m. Eastern time).

UNITED STATES STEEL

"Job-Fitted" HYDRAULIC PRESS



Those tough production problems that require something extra in drawing, forming, bending, hobbing, forging or other press performance are just the kind that Elmes engineers like to be called in on. More than 60 years in the specialized field of hydraulics has built the Elmes reputation for recommending and supplying hydraulic presses that are "job-fitted" for profit-making performance, no matter how special the job.

While a wide range of standard Elmes Press designs meet all usual requirements in drawing, forming and other press work, the development of special presses "job-fitted" to the customer's exact requirements is a major part of Elmes engineering service. Whatever your pressing problem, it will pay you to call in Elmes for consultation and recommendations. Distributors in principal cities.

American Steel Foundries

Elmes ENGINEERING DIVISION

1161 Tennessee Avenue, Cincinnati 29, Ohio

METAL-WORKING PRESSES • PLASTICS MOLDING PRESSES • PUMPS • ACCUMULATORS

Spot news...

- **Germany's Borgward is the most likely candidate** in Chrysler's search for a foreign subsidiary to make small cars in competition with Ford and GM's recently announced foreign small-car imports.
- **Inclinable presses running at 3600 strokes per minute** may soon be developed as an offshoot of two-speed press clutches being made by several builders.
- **Scotching persistent rumors** that Ford's Aircraft Engine Division, Chicago, is being phased out of jet engine production: the Division has $855 million in Air Force orders on hand, enough to keep it going well through 1959. Not only that, contract negotiations are increasing, not decreasing, AF backlogs.
- **Three New York State Labor Dept physicians** claim the inert-gas-shielded-metal-arc welding process introduces "hazards of a kind and magnitude not encountered in conventional arc welding," i.e., ozone concentration, increased ultraviolet radiation, metal fumes and oxide of nitrogen. Claim studies in three plants turned up three severe and one minor cases of pulmonary irritation.
- **Czechoslovakia's Skoda machine tool works** has been forced to switch from tool building to manufacture of equipment for Soviet nuclear power plants.
- **Road-building and heavy construction machines** are reportedly "gathering dust in manufacturers' storage areas because of (1) decline in new housing starts, and (2) slowness in getting the Federal Highway Program under way.
- **Ford's 1958 family of engines will feature a wedge-shaped combustion chamber** machined into the cylinder block. Mating head surfaces are flat, reminiscent of those on the old Cord V-8's (Editor's note: Cord, not Ford). And the new Dodge-De Soto engine marks Chrysler's abandonment of the complicated dual rocker arm and hemispherical combustion chamber design.
- **One-third of all factory workers in Poland are redundant,** but their dismissal would worsen an already bad employment situation (2.5 million out of work). Nevertheless, Russia, the West and the U S are all wooing Polish trade (see p133).
- **Investment casting industry will be hard hit** by the Air Force's gradual shift from aircraft to missiles. Reason: investment casters make large quantities of jet engine blades and buckets. One industry official predicts that the industry now must develop new processes and products to survive. A 15-20% cutback in order volume from this year's $100 million is expected in 1958.
- **Auto parts used by U S military forces in Japan** are reportedly being smuggled to Hong Kong in large quantities for re-shipment to Red China. Japanese firms, who know it's illegal, are said to be responsible.
- **A survey of 700 Wayne County, Mich (Detroit) families** by the University of Michigan shows that 55% of the employed population works a standard 40-hr week, 27% work 41 to 50 hrs, and 18% more than 51 hrs.
- **A fully automatic, hopper-fed machine for checking size and ovality** of small cylindrical components has been developed in England. Rotating air gaging head is supported by pneumatic relays to provide instantaneous sorting.

Spot index to major News stories...

Navaho Missile Kiss-Off 130
Senate Probes Metals Industry Prices 132
Poland Eyes Western Tool Markets 133

Field Report 136
Names in the News 139
Washington 75
Detroit 77
Machine Tools 79

What's Ahead
in Metalworking 83
in Business 84
Gaging Surplus
Machinery 202

The unusually large broach produced for a heavy equipment builder is given careful final inspection by Continental Tool engineers before shipment.

Ever seen a broach this big before?

HERE'S HOW IT WAS MADE—AND WHY

It takes a large tool to broach accurate involute splines in an 8.040″ diameter by 4.750″ long hole in one pass in a steel part.

Yet that's exactly what the mammoth broach shown above is doing today for a major producer of heavy earth-moving equipment. Its size alone — 8″-plus diameter by 74″ length—makes it one of the largest of its kind ever produced by Ex-Cell-O's Continental Tool Works. To make it, required a series of critical manufacturing operations highlighted by the hardening process applied to the shell main body.

One more example of how Continental engineers, plant personnel and facilities team to deliver broaches tailored to meet manufacturers' requirements. Perhaps you have a specific problem you'd like to discuss with them. Simply call your local Ex-Cell-O representative—the service costs you nothing, of course.

Continental

CTW

TOOL WORKS

DIVISION OF EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

57-69

Washington ... NEWS REPORT

Senate money fiscal probe . . .

As the Senate Finance Committee's long-drawn-out investigation of the administration's tight money policy goes into its second round, the Democratic-controlled Committee's objectives are becoming clarified.

First is the Democrats' aim to exploit the administration's tight money and tax policies for political advantage next year. Second, is to turn up information on how tight money affects the economy—with an eye on deciding whether we're in the midst of a new type of inflation which might require a new set of fiscal and monetary counter-measures.

Outgoing Treasury Secretary Humphrey, who's to become Board Chairman of National Steel Corp, has been put through the ringer by Finance Committee Democrats. He conceded that general credit restriction as an anti-inflation measure has serious drawbacks which he wished he knew how to correct.

Taxes and capital spending . . .

Humphrey also conceded that current inflation is due more to a rapid speedup of business plant and equipment expenditures than to an expansion of consumer buying. Retorted Senator Fulbright (D, Ark): the Eisenhower administration is suffering from the fruits of its own tax policy. "The tax bill of 1954 is far more the real cause of the difficulties than any other single thing that has been done."

Humphrey's outlook on the money market: Bond prices might dip further as interest rates rise. But "on the other hand there are some indications that lead you to believe a change is not too far away."

This was in line with one of the major points Humphrey developed: the possibility that general credit restrictions are starting to take hold along classic lines, slowing the economy down, halting creeping inflation.

Humphrey said that letting a policy of general credit stringency take its natural course "does create some hardships, some greater hardships in some places than in others." The trick, he said, "is not to relieve hardships—because you have got to have hardship—but to try to even the hardships out as nearly and as fairly as possible." He would not admit that large corporations manage to avoid general credit restraints.

Referring to the slowdown in the new plant and equipment investment reflected in official figures the past six months, Humphrey said tight money is exerting a holddown on large capital investment as well as on home building and other small construction.

Federal budget freeze . . .

The administration's freeze on federal expenditures (see p130) has stirred up a Congressional ruckus. At press time, some Democrats were threatening to fight for rescission of appropriation bills already passed and for calling back government leaders for another round of appropriation hearings.

The Democrats fear the administration is angling to take credit for future tax cuts. They want to know why the administration now tries to cut a budget Congress had been told earlier could not be cut any more and why it asked for a bigger appropriation this year—notably for defense—if a ceiling was to be put on expenditures and obligations.

But the administration is frankly setting the stage for a 1958 tax cut. The new spending ceiling is supposed to halt the uptrend in government outlays scheduled in the new budget. It will be used as a measure to slash lots of controversial programs.

In the past, the military services in particular have been able to go ahead with certain projects—like duplicating missile and plane development—over the objections of the Defense Comptroller through effective politicking with the Defense Secretary, the White House, or Congress. The budget freeze provides a new weapon for the budget cutters unless the storm now brewing in Congress upsets it.

Tax relief . . .

While President Eisenhower has ruled out tax reductions for fiscal 1958, he has left the door open for cuts next year. He has rejected "substantial" tax relief but has asked Congress again—in a letter to the House Ways & Means Committee—to think about tax cuts for small business. Included is a proposal for fast writeoffs on purchases of used capital equipment.

But across-the-board relief for industry is doubtful. Indeed, Democratic critics—along with some administration leaders—say the 1954 tax relief bill over-stimulated capital spending and has helped push up industrial prices. The most corporations can look for is a minor cut in the current 52% combined normal and surtax rate, scheduled by law to fall to 47% next July but more likely to be allowed to go only to 50%.

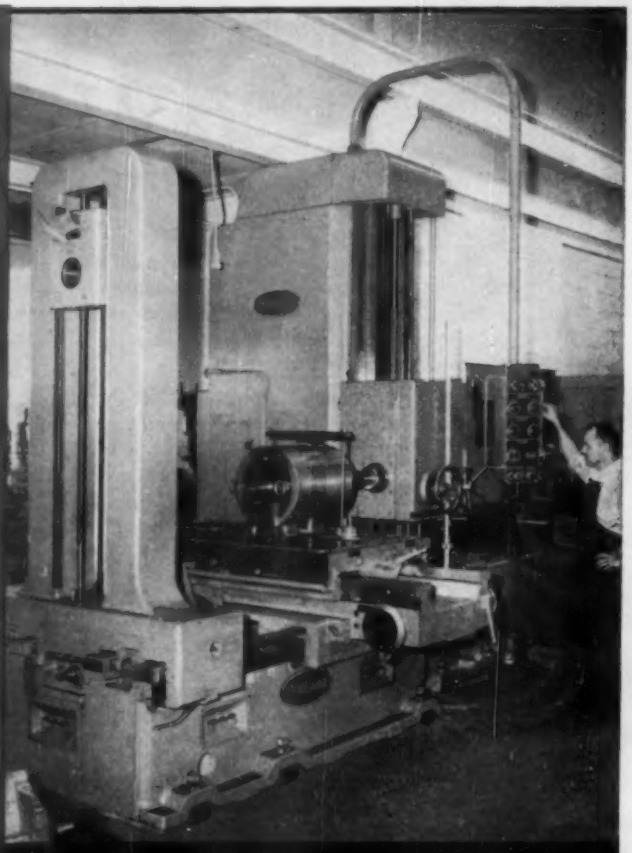
"The only Horizontal Boring Mill of modern design today is the

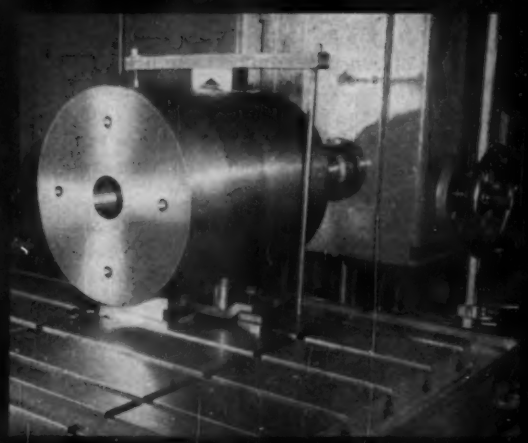
BULLARD

H. B. M., Model 75"

So says Mr. Arthur D. McDonald, President of E & M Enterprises, Inc. of Middleport, New York, builders of special machinery and tools for industry.

"There is no comparison" continues Mr. McDonald, "between our previous boring mill and the Bullard Model 75 — it is more accurate, faster, has more capacity, is simple to operate, has greater rigidity — all of which add up to more weekly production of . . . precision parts". . .





How about You?

Are you getting these same advantages in your manufacturing — if not, phone your nearest Bullard Sales Office for complete catalog or write

THE BULLARD COMPANY
BRIDGEPORT 9, CONNECTICUT

Detroit ... NEWS REPORT

Preview for 1958...

Making its bow this fall will be Ford's much-talked-about Edsel. Costing $250 million to produce, the Edsel will debut in four models, priced (with considerable overlap) between Ford and Mercury, and borrowing components from both.

Added to this will be some notable fresh details: pushbutton transmissions, controls in the steering wheel hub, and a driver-operated trunk lid.

As in the new Mercury, brakes will be self-adjusting throughout lining life. The Edsels will have vertical radiator grilles like the old Packard, no tail fins. Air suspension is optional.

Ford, facing Chevvy's forthcoming big push to regain lost market percentage, has gone all out to restyle a car that was all-new from rubber to roof this year. Only an expert will be able to tell that it's a facelift job. Adding to the sales pitch will be new V-8 engines, dual-range automatic transmission, optional air springing. Production goal for 6-cylinder models has been upped to 15%, and the retractable hardtop will still be a Ford exclusive.

With an eye to the sporty family trade, the Thunderbird has been completely redesigned and elongated to make room for a rear seat. The unitized bodies will share production lines with those for Lincoln, which incidentally may be the widest and longest, but not necessarily the highest, car on the highway. Air suspension is standard.

The juke-box styling that may have slowed current Mercury sales has been toned-down some for 1958. Mercury's new longer-wheelbase Park Lane series will bring the line closer pricewise to Lincoln. Air suspension is optional.

Over at General Motors, Chevrolet and Pontiac will share the most extensive redesigning in recent Detroit history. Instead of fins, both cars will have sculptured rear fenders. Bodies will be 3 inches lower.

Chevvy has an all-new V-8 engine to offer for option on cars and trucks. Also available: dual headlights, fuel injection, air suspension.

Along with the Corvette, which will be continued in the same plastic format, both Chevrolet and Pontiac will make an additional sports car. Chevrolet's will be a racy four-passenger hardtop patterned after the "Impalla" dream car shown at the 1956 Motorama. Pontiac will dress up and pep up one of its standard convertibles.

Buick and Olds, suffering most from public rejection of current GM styling, will eliminate some of the obvious drawbacks such as the three-piece rear windshield and fluted roof line, and the famous, or infamous, Buick portholes. Grilles, fenders, hoods and rear decks have been changed on both nameplates in an expensive effort to regain aesthetic favor. Air suspension is optional on both cars.

Cadillac for '58 can rest comfortably on its '57 sales laurels, so its changes will be moderate, plus standard air suspension. Future of the super-expensive El Dorado Brougham is in doubt.

Only minor styling changes are slated for each of the five Chrysler nameplates in 1958—theory being that the "Forward Look" is too hot to change. That's the theory. The fact is that three two-year tooling cycles in a row have cleaned out the Chrysler retooling treasury.

Chrysler makes will retain torsion-bar-front and leaf-spring-rear suspension, despite some talk about putting air bags at the rear. Look for this in 1959, though.

Despite Detroit's self-imposed moratorium on power and speed, Chrysler will continue to plug its "hot rods," with the mighty 300 D (400-hp engine, fuel injection) as top dog.

Dodge and De Soto will get all-new interchange-V-8 engines of orthodox design, while Plymouth will plug the economy of its sixes.

All models will still feature pushbutton controls and dual headlights.

American Motors will streamline (1) its operations, and (2) the shape of its "senior cars" (Nash and Hudson), by adapting Rambler body structure to all lines. Hoods and trunks will be longer. The Rambler will have dual headlights, optional air suspension and fuel injection.

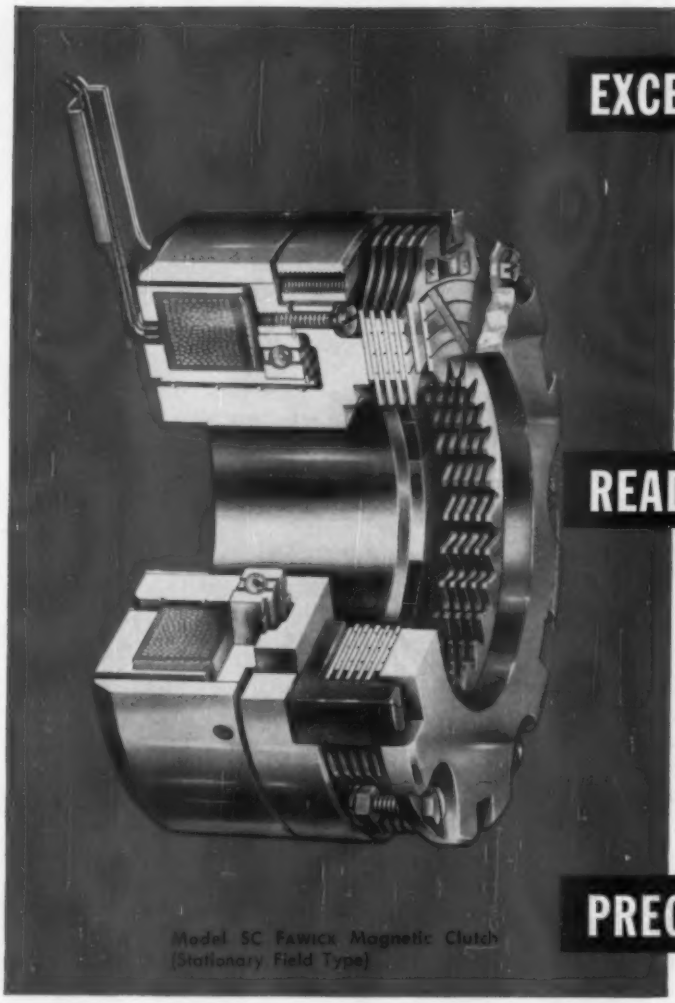
Revived version of the 100-in.-wheelbase Rambler will have a new 2-door body shell. AMC's outlook for '58 is bullish—sales goal is 100,000 Ramblers, upsurge in Metropolitan sales.

Studebaker-Packard plans only minor styling and engineering changes, with emphasis on the sporty Hawks and the austere Scotsman. Packard, too, will be augmented by a Hawk-type model. Superchargers will be fewer.

Studebaker-Packard will enter the fall selling season with more than 500 dealers stocked and trained to sell and service imported Mercedes-Benz cars and trucks.

Hoped-for Mercedes-Benz volume for the first year is 12,000 units. S-P morale is up, and its crash cost-cutting program, aimed at breaking even on 80,000 cars and trucks per year, can now be termed a success.

the electric clutch that provides ALL the advantages



Model SC FAWICK Magnetic Clutch (Stationary Field Type)

EXCEPTIONAL PERFORMANCE

. . . that's FAWICK Magnetic !

FAWICK Magnetics provide outstanding operating advantages that add greatly to overall machine performance. First, they supply smooth, dependable clutch or brake operation with timing and torque action under complete control—local or remote, manual or automatic. They are exceptionally fast and accurate and will contribute effectively to modern machine operations requiring high speed clutch or brake action.

READILY ADAPTABLE

. . . that's FAWICK Magnetic !

The design features of FAWICK Magnetics provide two groups of advantages, First, the extra large bores, compact space-saving envelope dimensions, and "ready-to-use" completeness make them most adaptable to both new designs and existing machines for either wet or dry operation. Second, the internal operating design features provide fast, smooth, accurate clutch or brake action that can match any and all advanced operating requirements of modern equipment.

PRECISION ASSEMBLY

. . . that's FAWICK Magnetic !

FAWICK Magnetic Clutches and Brakes combine quality materials and precision manufacture to provide the finest units for long, top-performance operation. Each component is made of the finest materials for its specific function, then carefully inspected and assembled. The complete assemblies are adjusted and rigidly tested to insure top performance.

For detailed information on FAWICK Magnetic Clutches and Brakes, write for Bulletin M-101 or contact your nearest FAWICK representative.

FAWICK AIRFLEX DIVISION
FAWICK CORPORATION
9919 CLINTON RD. • CLEVELAND 11, O.
In Canada, Fawick Canada, LTD., Toronto

FAWICK Magnetic
INDUSTRIAL CLUTCHES AND BRAKES

NEWS REPORT

Machine tools ...

Builders expect fall pickup . . .

Most machine tool builders are convinced that new orders will be considerably better in the September-December period than recently.

They have little hope that a pickup will occur before September, feeling that the cautious attitude of buyers will lead them to put off placing orders during the summer months.

With backlogs dwindling, builders are letting subcontracting arrangements expire as contracts are completed.

Overtime has been cut out by many builders, who now are down to a 40-hr, single-shift schedule. Nevertheless a surprising number of companies still are operating 45 to 50 hr, particularly in assembly departments to meet delivery promises to customers.

Automotive buying of machine tools, which has been conspicuously small all year, promises to improve the final four months of 1957. But no deluge of orders from Detroit is in the offing.

The amount of retooling to be done for 1959 models requiring new machine tools, will be modest. From the standpoint of production facilities, the automobile industry is overbuilt.

Detroit to buy more in 1958 . . .

Next year should see substantially more purchases of machine tools by automotive companies than this year. The business will stem from needs for 1960 models to be announced in the fall of 1959.

Not all machine tool builders are complaining about the sliding off of business. One company reports sales the past four weeks 20% better than in the preceding four weeks. Another builder says that sales have been picking up and backlogs increasing. A third company declares that its backlog is one-fifth larger than a year ago. Its outlook is very good because it has been concentrating on makers of rockets and guided missiles.

A maker of specials reports a 12-months' pileup of orders, equal to that of a year ago. It has been rebuilding a considerable number of transfer machines, but this activity is slowing down.

Another builder happily states that sales have been rising in recent weeks and inquiries for its standard machines are growing. Its shop is working a 50-hr week on two shifts, with no thought of a cutback. Its 1957 sales are expected to come very close to the 1956 volume.

One builder claims that business has boiled down to intense competition among engineers—"the only thing the customer wants is a machine that will save labor expense and is specially engineered to accomplish this objective."

Cincinnati Milling Machine Co made shipments of just under $40 million in the second quarter (12 weeks) ended June 15. The figure matched that of the first quarter. Unfilled orders at the start of the third quarter totaled $81 million. President Frederick V Geier states that the company continues to receive a healthy volume of inquiries.

New line of machines aids sales . . .

Bringing out a new line of machines, incorporating major improvements, is about as foolproof a way of insuring good business ahead as can be devised, a well-known builder of standard machine tools believes. This builder now is in the process of putting on the market a new line and expects thereby to have the jump on his competitors this fall.

His theory has already worked out in practice. He developed and marketed a major new machine a year ago. The momentum of the sales sparked by the new machine has carried production and backlogs along at a higher level by far than otherwise would have been the case.

This builder's experience is not unique. Other machine tool companies report the same kind of response. Wherever builders have offered a new line of machines in response to an obvious need by users, they have been able to operate at a rate considerably above the average for the industry.

Bureau of Ships proposes trade-ins . .

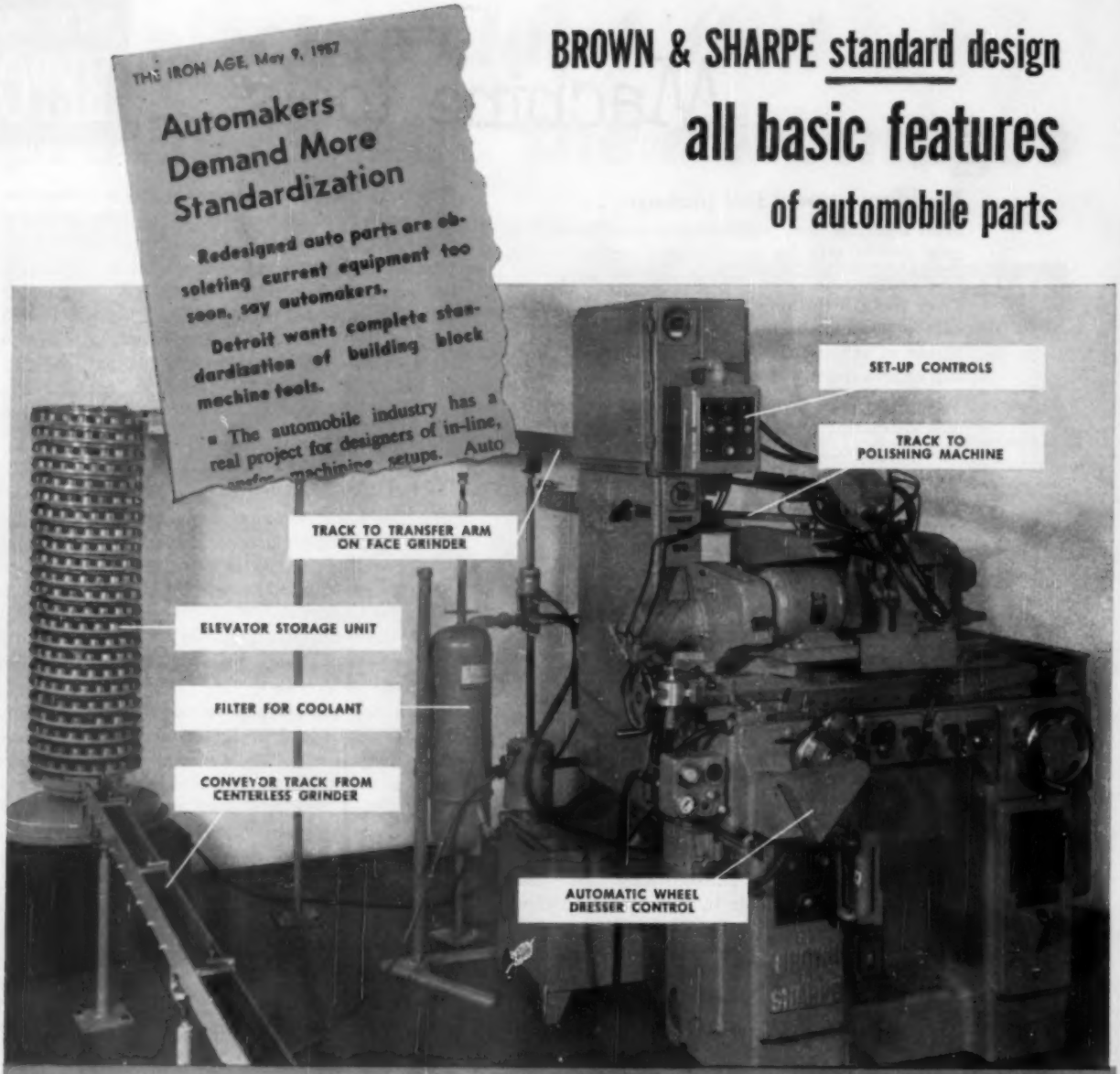
Navy men are figuring out ways and means of making their 1958 budget for machine tools stretch as far as possible and have come up with the idea of trading in old machines on new ones.

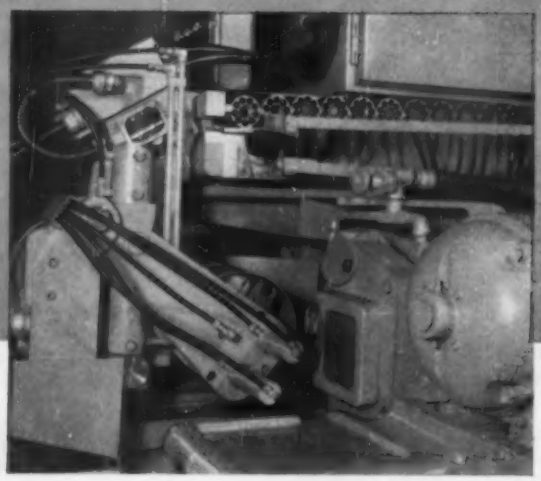
The idea has taken hold in the Bureau of Ships. Its officials think that most machine tool builders will be tempted to handle the problem by calling in surplus machinery dealers to put a price on and take over the used machines, wherever a deal for new machines is worked out.

Bureau of Ships is said to have some $3.2 million set aside for replacement of old machine tools in shore establishments. This figure does not include any money that might be spent for new machines for the fleet (aboard ship) or at overseas bases.

BF

BROWN & SHARPE standard design
all basic features
of automobile parts


THE IRON AGE, May 9, 1957
Automakers Demand More Standardization
Redesigned auto parts are obsoleting current equipment too soon, say automakers.
Detroit wants complete standardization of building block machine tools.
The automobile industry has a real project for designers of in-line,
SET-UP CONTROLS
TRACK TO POLISHING MACHINE
TRACK TO TRANSFER ARM ON FACE GRINDER
ELEVATOR STORAGE UNIT
FILTER FOR COOLANT
CONVEYOR TRACK FROM CENTERLESS GRINDER
AUTOMATIC WHEEL DRESSER CONTROL



- **No. 11 FACE GRINDING MACHINE** is used in a completely automated production line, between centerless grinding and polishing operations.
- **OPERATION** is grinding one face of cylindrical parts for a power steering mechanism.
- **AUTOMATIC CYCLES** and work-handling equipment eliminate manual operations. Grinding, wheel-dressing, work loading and unloading are fully automatic. When grinding wheel is reduced to minimum usable diameter, the machine automatically stops, for replacement of the wheel by the operator in charge of the machine.
- **SPECIAL TRANSFER ARM** (left) has two chambers, swings down to unload finished part into one chamber, and load chuck with

MILLING, GRINDING, AND SCREW MACHINES • CUTTERS
MACHINE TOOL ACCESSORIES • PRECISION TOOLS • PUMPS

of the No. 11 Face Grinder provides

needed for FULL AUTOMATION

production at Thompson Products

Rapid and costly obsolescence of special machines can be avoided when you start with a *standard* machine that permits designing for any degree of automatic operation.

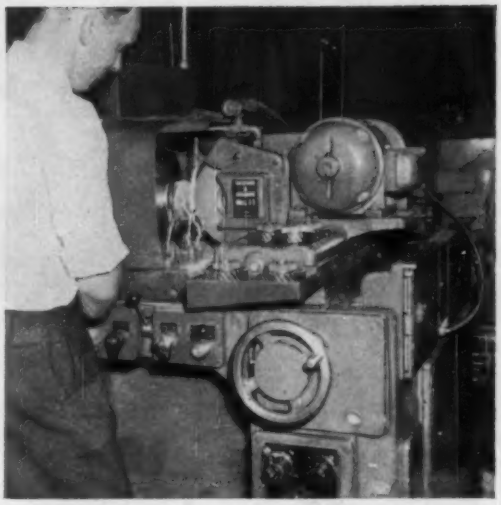
At Thompson Products, the No. 11 Face Grinding Machine (left) is completely automated, with the addition of special automatic cycles and work-handling equipment, for grinding power steering parts. Production rates meet full demand for a leading automobile manufacturer.

If specifications should be changed, or if the part is eliminated, the machine can be reconverted for revised special requirements, or for standard use, without major expense.

The basic standard features of the No. 11, so readily adaptable for automatic operation, are your assurance of top production on the wide variety of work it handles without special equipment, like the gear face grinding operation (right) at New Process Gear Corp.

For maximum diamond and wheel economy, automatic control of wheel-truing is an available feature of the No. 11 Face Grinder. The operator is relieved of this responsibility, eliminating the possibility of waste, and extending production time between wheel changes.

Brown & Sharpe design specialists will survey your grinding operations at your request. Let them show you how to make your machine investment pay the highest return . . . in productivity, in lasting economy. Write: Brown & Sharpe Mfg. Co., Providence 1, R. I.

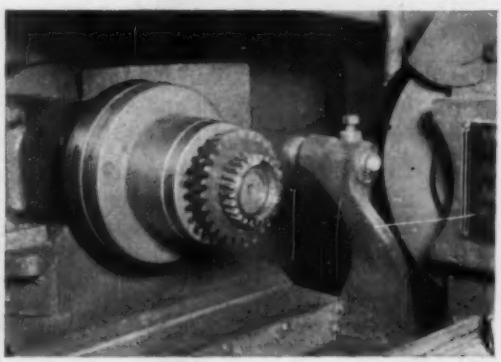


Speeds production, lowers cost on jobs requiring standard features only

Grinding the face of these transmission gears, at New Process Gear Corp., is typical of hundreds of jobs for which the No. 11 is quickly adaptable, without special equipment, employing only the standard features, which permit a semi-automatic grinding cycle and set-diamond wheel dressing control. One man operates two machines, at 85% shop efficiency. His total production, from both machines is 126 pieces per hour.

unground part from other. At top of travel, the arm ejects finished part into track leading to next operation, and loads unground part, for transfer to chuck. Chuck is flushed with filtered coolant after each unloading.

- **AUTOMATIC PRESET GRINDING CYCLE** includes rapid advance, wheel feed, spark out, and rapid retraction.
- **AUTOMATIC DIAMOND IN-FEED** and size compensation for wheel restrict wheel-dressing to preset intervals and amount, avoids excessive dressing.
- **PRODUCTION RATES** up to 300 pieces per hour are obtainable, depending on material, stock removal, and finish specifications. Work-loading time is about 4 seconds, which is overlapped by wheel-truing time.



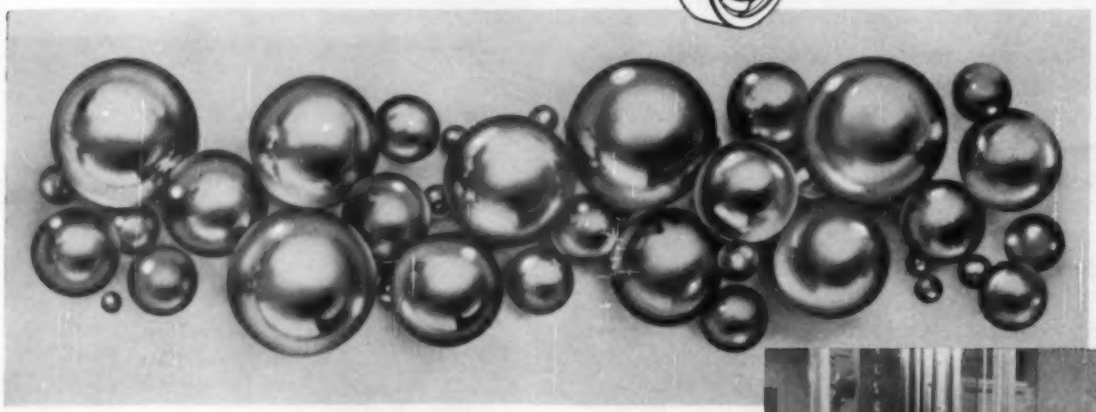
The home of PRECISION CENTER

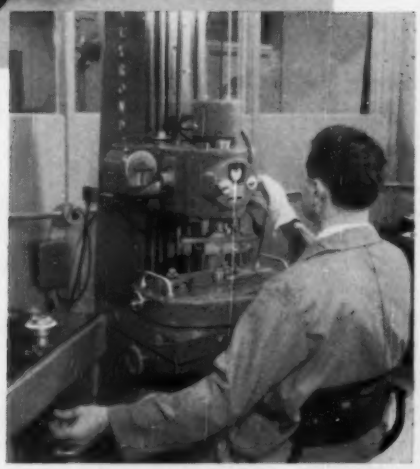
Brown & Sharpe BS

FACTS

about

NEW DEPARTURE STEEL BALLS





Talyrond gaging graphs of ball sphericity and surface finish give readings to within three one-millionths of an inch, assuring product superiority that meets your most rigid specifications.

Why Leading Manufacturers Choose New Departure Steel Balls

Prompt delivery . . . quality . . . and quantity . . . to fit your specifications! These are the major reasons why leading manufacturers choose New Departure to fill their steel ball needs.

To assure that every steel ball ordered meets your most rigid specifications, New Departure performs its own metallurgical laboratory inspections, its own annealing and wire drawing operations.

And . . . to process all orders readily, New Departure ball manufacturing facilities are maintained completely independent of all other production. This means that high-carbon chrome and stainless steel balls are quickly available in a complete range of sizes and specifications in quantities.

In addition, New Departure produces balls of special materials such as high nickel-cobalt base alloys, tool steel, plastics, nylons and vacuum-melted materials. For immediate attention to your ball needs, write or call New Departure, Division of General Motors, Bristol, Connecticut.

Send for Catalog SBC

BALL BEARINGS MAKE GOOD PRODUCTS BETTER

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN.

What's ahead ... in Metalworking

NEWS REPORT

Hardly any seasonal lull this summer . . .

Metalworking production is going along at an amazingly high rate this summer, pausing only for vacation shutdowns.

Any seasonal lull has been slight and not enough to make much of a dent in operations.

Capital goods producers continue to run on heavy schedules, some of them calling for overtime. Meanwhile, certain consumer industries are showing signs of an improvement that had not been anticipated at this time.

The automobile industry is assembling cars and trucks at a fast pace for hot weather.

The cloudy aircraft outlook is the chief minus factor in Metalworking. Aircraft employment, off in May and June, is likely to suffer further from stretchouts and cancellations. Washout of the Navaho missile project has put the Los Angeles area into a temporary blue funk.

Appliance industry looking up . . .

Household appliance industry is coming out of an unhappy inventory situation into better times. Sales are reported to be good at all levels—retail, wholesale and factory.

Everyone seems sure that the upward trend will gain momentum rather than slide back. Fourth quarter is expected to better the third.

Appliance manufacturers guess that wholesalers have been living off their stocks for some time, and now that their inventories have been whittled down, they are beginning to reorder.

Gray iron castings business is slow, but a pick-up in August is anticipated. Fourth quarter looks very good, based on new automotive orders and improved buying by machine tool builders.

The steel castings situation resembles that in gray iron, with operations down to 56% following a first-half average of 70%.

Commercial tool and die shops have been making heavy shipments at the expense of backlogs, which lately have declined sharply. The industry looks for a growing demand for precision tooling from electronics, aircraft, missile and business machines manufacturers. Orders should begin to come in this fall for tools and dies for 1959 automobiles.

Survey of Chicago tool and die shops reveals a shortage of around 620 skilled men, a drop of 100 from the previous month.

Competition is much keener than it was price-wise in all parts of the country, shops report.

Stamping business continues to be spotty, with a more-than-seasonal dip in general bookings

Backlog in orders for freight cars is gradually declining, but production should be good for many months.

Steel mills optimistic . . .

Steel mills feel optimistic about the rest of the year and even express confidence that the early months of 1958 will be very good.

They are counting on automotive demand to give them a lift in the early fall, but admit privately that some of the auto and appliance people still have quite a tonnage on hand.

Heaviest backlogs are in plate, shapes. Sheet and strip still are lagging.

176

AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

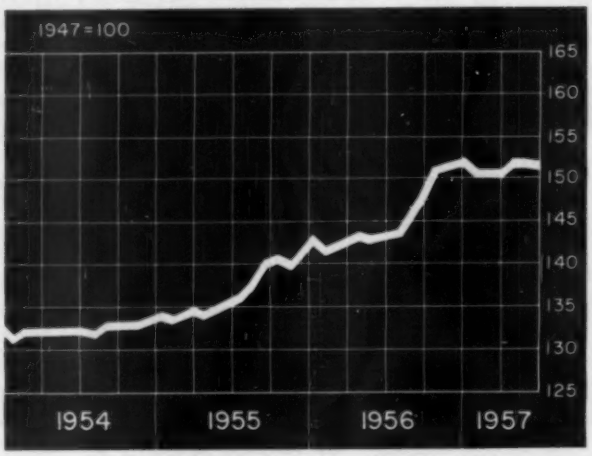
	JULY Estimated	JUNE Preliminary	MAY Revised	JUNE Year Ago
Total Index	**176**	**176**	**175**	**168**
Machinery	151	152	149	
Electrical Machinery	208	199	205	
Autos	125	127	110	
Other Transportation	370	371	333	
Other Metalworking	146	142	138	

NEWS REPORT

What's ahead: . . . in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	JULY Estimated	JUNE Preliminary	MAY Revised	JUNE Year Ago
Total Index	**152.2**	**151.9**	**151.9**	**144.0**
Metalworking Machinery	**176.9**	**176.9**	**165.8**	
Other Machinery exc. Electrical	**160.8**	**160.6**	**150.9**	
Electrical Machinery	**154.4**	**154.3**	**143.0**	
Fabricated Metal Products	**143.2**	**143.3**	**137.5**	



Second half outlook: just a little brighter . . .

While economists are generally agreed that second half of 1957 business as a whole will be better than in the first half, and that industrial production, too, will exceed January-June output, it is difficult for the moment to point up any definite business trends.

The industry-by-industry outlook for the rest of the year while somewhat brighter, is mixed. Take, for example. these non-metalworking industries:

- **Petroleum refining operations** in the first half ran 2.5% ahead of year-ago levels, but product stocks are still so high that refiners have had to hold back production. Outlook: little change.
- **Housing starts** were way down in the first six months of this year—an indicator that there will be fewer starts in second half 1957 than at any time since 1949.
- **Rubber manufacture,** 4% ahead of 1956 in the first half, will run about 5% ahead for the year.
- **Lumber production** was off a good 10% in the first half from 1956 levels. With housing starts dropping from an annual level of 1.16 million in 1956 to 950,000 this year, lumber output will probably hold to the down-10% level through 1957.
- **Construction materials,** too, (cement, glass, brick, gypsum products) dropped off from '56 levels in the first half—down 2% or so. A slight upturn is expected in the second half, enough to bring 1957 output even with that of 1956.
- **Textile production,** running 5% below 1956 in the first half, will close some of the gap in the last half—to bring 1957 about 3% below 1956.
- **Apparel production,** paradoxically in view of the slump in textile output, is 1% ahead of last year, should run 2% higher for the year.
- **Processed foods and beverages,** running even with 1956 in the first six months, will pick up just a trifle by year's end.

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	146.3	147.0	142.7
Steel ingot operations (thousands of tons)	2,073	2,015	377
Electric power output (million Kilowatt hours)	11,964	11,056	10,878
Production of automobiles and trucks	144,522	95,615	146,173
Engineering construction awards (Eng. News-Record, millions)	$386.4	$325.5	$391.3

QUARTERLY BUSINESS INDICATORS	Latest Quarter	Preceding Quarter	Year Ago
Gross National Product (billions)	$427.1	$423.8	$403.4
Expenditures of new plant and equipment (millions)	$ 37.9	$ 37.3	$ 35.9
Profits after taxes in primary iron and steel industry (millions)	$ 162	$ 185	$ 386
Profits after taxes electrical machinery industry (millions)	$ 190	$ 190	$ 190
Profits after taxes machinery (except electrical) (millions)	$ 375	$ 365	$ 392
Profits after taxes in motor vehicles and parts industry (millions)	$ 378	$ 166	$ 495
Motors and generators new orders index (1947-1949=100)	203.0	228.0	201.6

* Seasonally adjusted.
N.A. Not Available

BURGMASTER®
TURRET DRILLS

save space,
increase production,
hold close tolerances at

THE GARRETT CORPORATION'S
AiResearch Manufacturing Division

The part in the particular operation shown is a carriage used in a pressure-ratio transducer. Tolerance specifications require that all bores be within .0005 of centerline of each other.

Here's what the company has to say:

"Use of the Burgmaster Model 1C turret drill has been a valuable item in space conservation.

Four Burgmaster drills, each carrying six spindles, take up about 15 feet of space at AiResearch, while next to them a line of 20 single-spindle machines occupies three times the space.

The Burgmaster contributes to increased production and more proficient operation by operators, since it permits them to perform in one place a job requiring various types of spindles, which would otherwise necessitate moving back and forth on a line of conventional spindles. It allows use of a stationary jig for operations of various depths and sizes.

Tolerances within .0005 and less can be consistently maintained by the Burgmaster 1C on ream and bore diameters, with .0003 to .0005 on hole locations in jig work."

The Burgmaster 1C 6-spindle turret drill is a sensitive feed, fast operating machine. It features such important benefits as power indexing, preselective speeds and stops, time savings and increased accuracy by elimination of quick change tools. It easily handles holes up to ⅜" in steel. Larger capacity Burgmasters, both manual and automatic hydraulic are available.

For complete information, write Dept. AM-71

BURG TOOL
Manufacturing Company, Inc.
15001 S. Figueroa St., Gardena, Calif.

RIDGEWOOD, N. J. • CHICAGO • CLEVELAND
DETROIT • SAN LEANDRO, CALIF.

This brake is so large that the bed had to be detachable because of railroad clearance limitations encountered in shipping. It bends 20'-0" x ½" steel plate and is equipped with Steelweld's own tried-and-proven air-operated clutch and brake.

STEELWELD

BUILDS LARGE PRESS BRAKES

Regardless of Size—Small or Large—Steelwelds Have Much to Offer

ALTHOUGH Steelweld Brakes are built in a wide range of sizes, it is in the large classification where Steelweld's many fine features really show up. Brakes used for forming long plates—15, 20, 25 feet—or for working metal thicknesses of ¼ inch to 1½ inch, must be quality built to operate day in and day out on a continuous production schedule.

The entire line of Steelwelds is heavily built to withstand hard, rugged service. Steelwelds have all the features that make for fast set up, easy operation, accuracy of work, high output and simple infrequent maintenance.

We urge you to get the facts on these fine, quality-built machines.

STEELWELD
PRESS BRAKES

Write for free copy of Catalog No. 2010

STEELWELD DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 1466 E. 281 ST. • WICKLIFFE, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION · ESTABLISHED 1877

How Postponable Is It?

A new word—"postponable"—seems to be creeping into the vocabulary of production equipment buyers. You hear now and then a prospective buyer refer to a machine tool as "a postponable item."

What the buyer means is simply this: If things don't add up to a favorable economic situation, you can readily postpone purchasing new machines without causing much of a ripple. Just put the order on the shelf for a while. Take it down, dust it off and actually place it whenever it suits you.

Sounds easy. But just how much . . .

merit does this idea really have? What happens if you adopt, over any extended period, a "postponable-purchase" policy?

Let's concede, at the start, that a delay of a few weeks or a few months, except in a critical situation, does not do much if any damage. But suppose the time stretches out over a much longer period.

Take the current situation in Metalworking. We have seen boom times. Almost everyone has had a lot of business. A large amount of new capacity has been brought into being—too much, in fact, for current needs. We are in a buyer's market, not a seller's. And chances are slim for any change in this condition for some time.

The pressure is on . . .

to take business at a concession in price, because competition is very hot. More and more price deals are being reported by those who lose the orders.

At the same time, wage rates are rising. After you tack fringe benefits onto steadily rising hourly rates, inflated labor costs become a menace. At this point add on an average increase of 4% in steel prices. But you cannot stop there, because components that go into your product are rising in price just as fast as steel is.

If you choose to sit back and do nothing except let high-cost factors creep up on you, you can be sure of one thing: Your earnings will be in jeopardy. If you are interested in keeping up your earnings, then you should examine your costs and see if you can get them down.

One of the best ways to get your costs down is to install cost-cutting equipment. The management of one metalworking company has publicly proclaimed its intention to strengthen its production to yield a greater return on its investment.

That will not be possible if you are a devotee of the "postponable-item" theory. For "postponable" is equivalent to "do-nothing."

It is like the doctor's telling you . . .

that you have an ailment that is potentially dangerous. If you do what's necessary now to cure it, a minimum of pain and expense and risk is involved. But if you put it off, you probably are letting yourself in for a bad time ahead.

So it is with your production equipment. A minimum of pain and expense and risk is involved in replacing old machines promptly and effecting savings without delay. If you choose instead to let things ride, figuring that you will do something about it later, do it with your eyes open to the fact that you may be heading into a critical jam sooner than you may think.

Burnham Finney EDITOR

1/3 cost reduction combined with product improvement... by use of Cincinnati Shear and Press Brake

... at **DE WALT INC.**

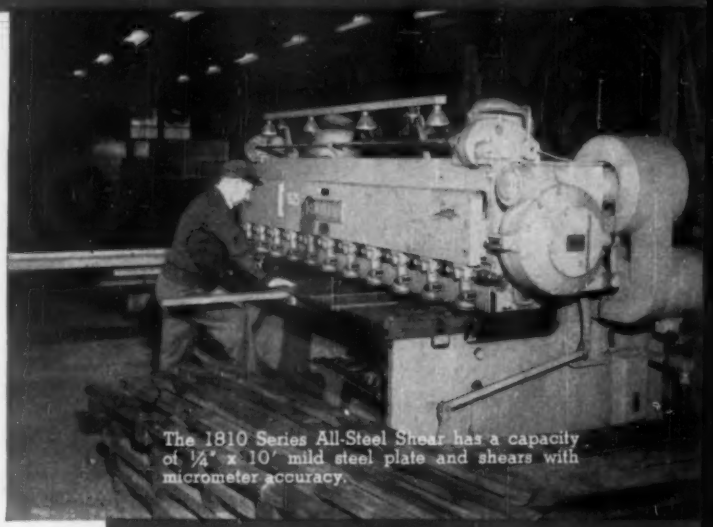
Lancaster, Penn.

The steel bases of all DeWalt woodworking machinery must be perfectly square, flat and true. Both home shop and heavy duty industrial machines are produced on the Cincinnati Shear and Press Brake shown.

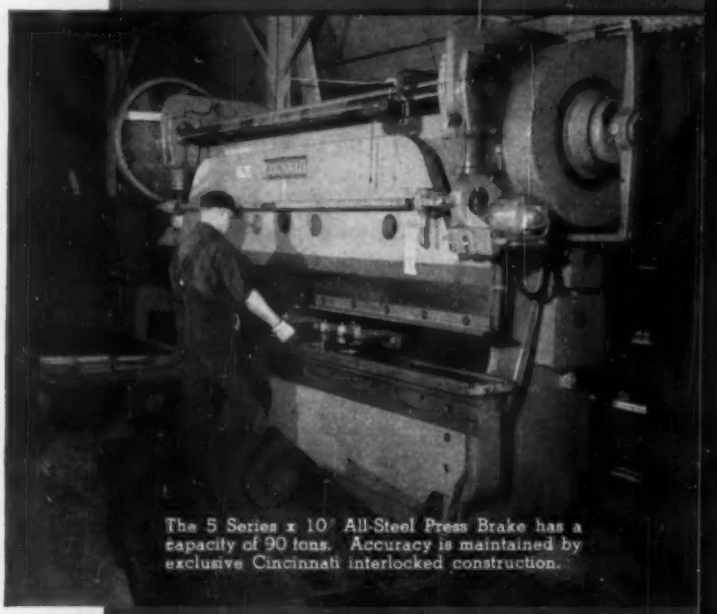
This performance story from DeWalt Inc. tells of improved quality and reduced costs. We quote: "Before purchasing the Cincinnati Shear and Press Brake, we bought formed channels and arc welded them together at the seams. We now buy sheet steel stock—then cut, punch, form, and spot weld the steel bases in our own plant. We have ***reduced costs on this operation by over 1/3*** on the first run employing these methods, and expect costs to diminish still more as operator familiarity and efficiency increase. In addition to the cost factor, it was previously difficult to maintain precise flatness in the tables. Using the new methods and the Cincinnati machines, we now have no difficulty."

Note the improved design of the Model MB "Power Shop" machine shown at right above. The new, improved cabinet is now produced on the Cincinnati Shear and Press Brake at an ***overall cost reduction of 15%***. Previously the cabinet at left was a purchased item.

Write Department **A** for Catalog B-4R and Catalog S-7R and consult our Application Engineering Department about your production problems.



The 1810 Series All-Steel Shear has a capacity of ¼" x 10' mild steel plate and shears with micrometer accuracy.



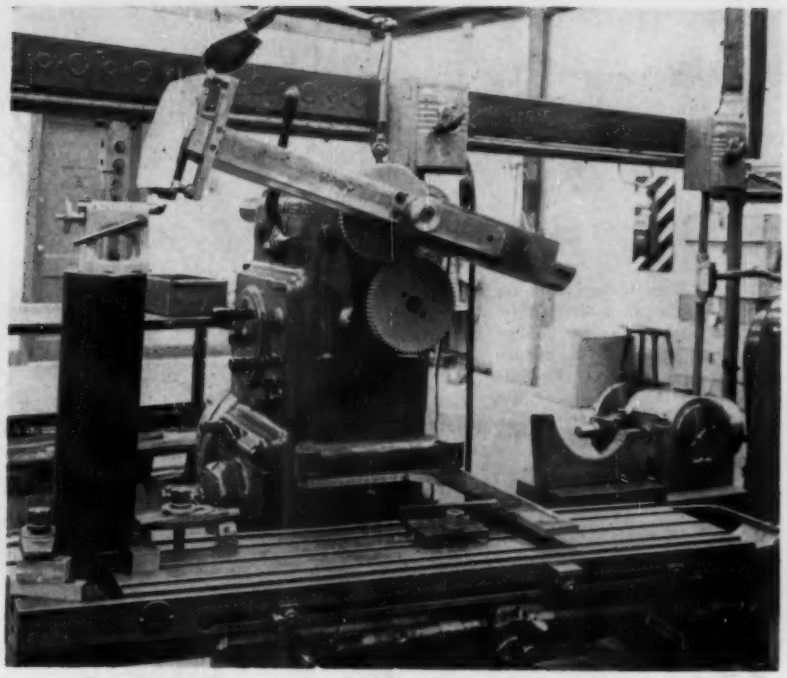
The 5 Series x 10' All-Steel Press Brake has a capacity of 90 tons. Accuracy is maintained by exclusive Cincinnati interlocked construction.

Photos courtesy DeWalt Inc., Lancaster, Pa.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS · SHEARS · PRESS BRAKES

American Machinist



Compound curve is generated . . . on 6-in. nylon square by mounting it on end of rotating arm and guiding the cutting tool by cam

Milling machine becomes tracer lathe to cut nylon

Faced with a tracer-lathe job and having no tracer lathe of adequate size, this company rigged up a milling machine to do the job

W P STEPHENS, manufacturing supt, ARLINGTON DIV, MELPAR INC, FALLS CHURCH, VA

The problem of generating a compound curvature on a 6-in. square of nylon—a piece which will become a small segment in the skin of a guided missile and, therefore, must conform to the missile's outside diameter in one direction and to the ogive profile of its nose in the other—is a prime assignment for a tracer lathe.

That's all well and good, provided you happen to have a 36-in. tracer lathe standing around the shop, and provided you don't mind setting it up to run a 15-piece lot of parts.

Melpar Inc of Falls Church, Va was faced with this requirement, but it didn't have the tracer lathe. However, it did have some clever shop men who solved the problem by rigging up a milling machine to do the job.

First of all, they had to provide clearance for a 36-in. swing. This was accomplished by dropping the milling machine table to its lowest point and mounting a secondary work spindle to the overhead support arm. Two 10-pitch nylon laminate gears were cut to drive the work spindle.

The second step was to set up a carbide cutting tool so it could be fed into the work at the proper elevation. For this, the tailstock of a dividing head was fastened to the top of a piece of 5-in.-dia steel pipe mounted rigidly to the table. A cutting tool was substituted for the tailstock center, and the feeding ring was calibrated to read in thousandths of an inch.

The next problem was to get the cutting tool to follow the ogive curve. An ogive cam was made and mounted on a support extending from the vertical base of the machine. Then a cam follower was mounted on the table. To keep the follower on the cam, the table leadscrew was removed and a 150-lb weight was hung over a pulley at the right side of the machine.

Finally, the work-holding fixture was built, mounted to the secondary spindle, and perfectly balanced, holding and supporting the part properly. It was provided with a gaging pin from which the various radiuses of the workpiece could be checked with a micrometer.

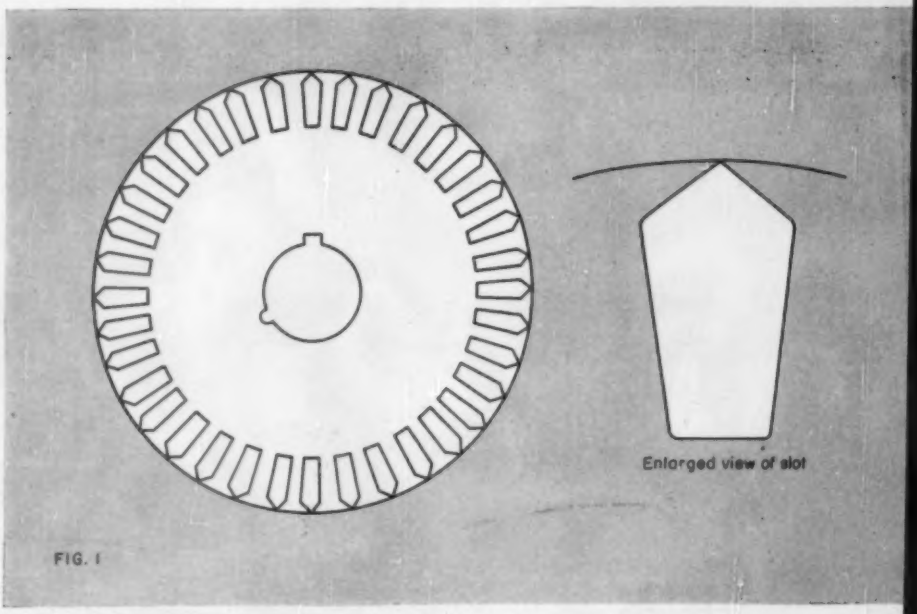


FIG. 1—Lamination rotor for a small electrical motor provides a prime example of a product requiring a high order of die-making skill. **Fig. 2**—The die member of the combination tool is made of two concentric rings, each having a portion of the slots, and press fitted at the joint.

How to make a lamination die

Usually, die articles talk about design pointers. Most people seemingly overlook the methods and planning required to build a press tool. But here is the way they go about it in England

ALFRED N APPLEBY, Inspector in Charge, Toolroom, BRITISH THOMSON HOUSTON CO, LTD, RUGBY, ENGLAND

PIONEER diemakers designed, built and proved press tools. Today much of the lore of the old timers has been reduced to rules that are reflected in the design details, dimensions and notes on the die drawing. Yet the need for skill in making a die and inspecting it still exists.

To build a workable die, the diemaker will examine the drawing and decide the practical methods for making and assembling the components. A combination tool for laminations serves as example of a tool where proper organization of the work is absolutely essential.

The lamination, Fig. 1, is a punching for assembly into rotors for small motors. The diemaker knows that when the punchings are assembled, the slots must match so that proper balance of the assembled rotor is secured.

The die member of the combination press tool is made first. I have particularly chosen this type of tool, because I know how difficult it is to make these slots to the many qualities required and again how difficult it is to produce a small slot of this description.

The die half is made in two rings, an inner and an outer ring, the joint being made at the shoulder of the slot as shown in Fig. 2. After the parts are machined in their soft state, they are hardened and ground.

OUTER RING

The outer ring is turned and roughed out on diameters and slots, leaving the agreed amount for grinding. The apex of the slot is produced by a formed grinding wheel. Necessary taper for slug clearance is put on at this stage by tilting the grinding fixture.

On many milling machines, an attachment is supplied to perform a slotting operation. The attachment is adapted to do a grinding operation, by replacing the slotting tool with an auxiliary grinding attachment, the wheel being driven by a fractional-horsepower motor. Of course, the grinding wheel must pass through the center of the grinding fixture. This grinding fixture, Fig. 3, has a sub-table anchored to the milling machine. On the top of this table, a revolving plate is assembled. The revolving piece is jig bored with a ring of holes, according to the ring of holes to be pierced, and these holes are on a suitable pitch circle. By the aid of a plunger, the outer ring is indexed pitch by pitch, until the circle is completed. The revolving plate can be replaced with other plates with different hole spacings.

Because of the depth of the slot

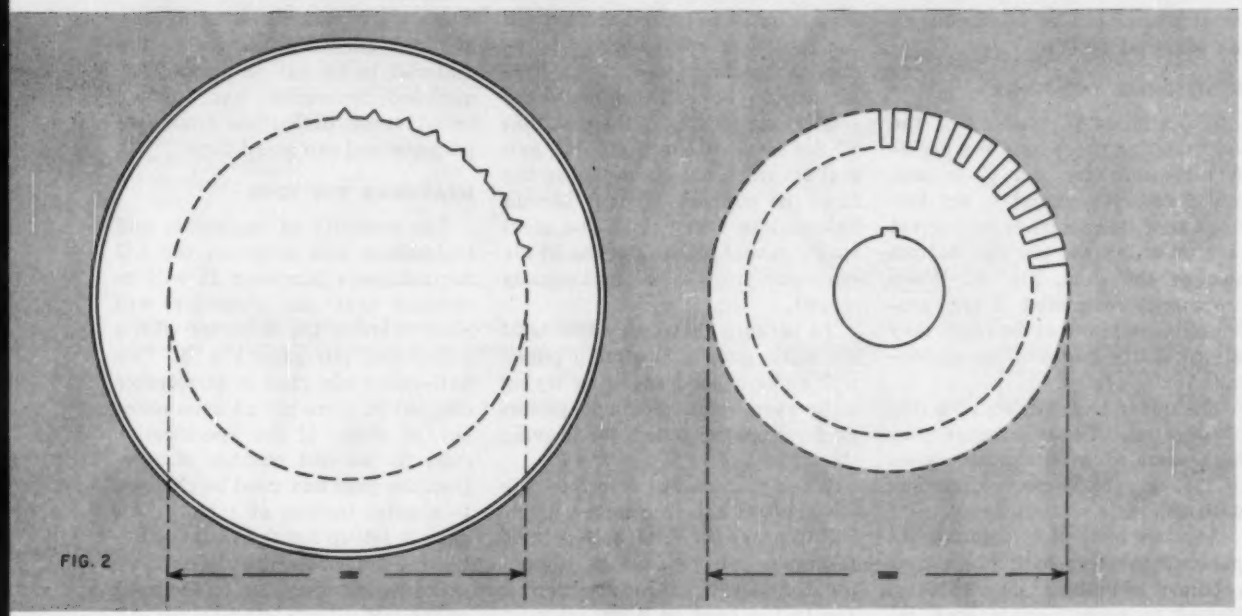


FIG. 2

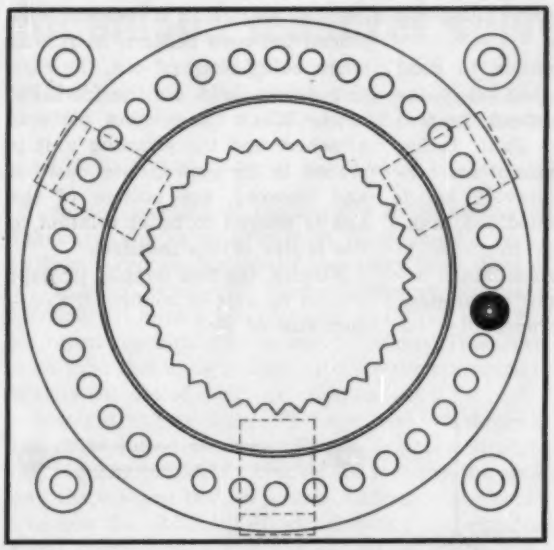


FIG. 3—A spacing fixture is used for machining the apex of each slot in the outer ring

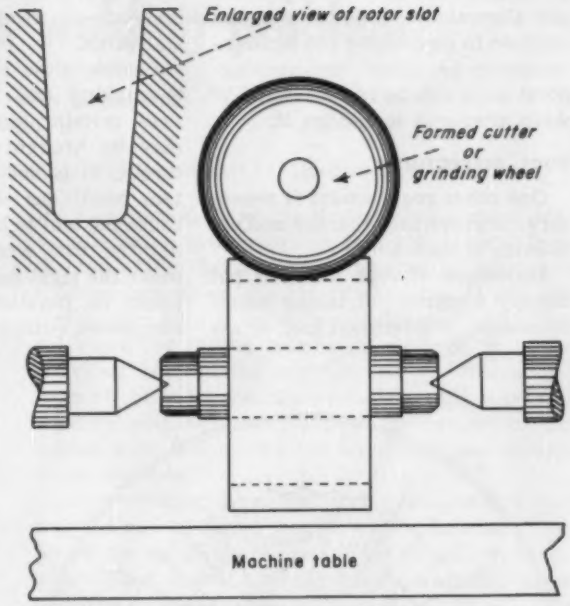


FIG. 4—Slots in the inner ring are milled, later ground, by a setup in connection with a dividing head

in the inner part of tool, it is advisable to reduce the grinding allowance to a minimum. It is not easy to grind this shape. The sides of the wheel are brought into play, and jamming must be avoided.

All spacing on this part of the tool is completed with the aid of a 40:1 dividing head set on the milling machine, while the inner ring is put on a mandrel between centers. The milled slots are finished on a surface grinder.

For roughing out this part, a formed milling cutter will be required. Attention must be paid to the depth that the cutter must travel. Allow the cutter to scrape the OD of the inner ring. Take note of the saddle graduations. By many small cuts, the depth of the slot is established, by calculating the relation between the top scrape to the required depth as quoted on the line drawing.

After hardening, all faces and slots are cleaned up by grinding wheel dressed to just less than a full form. Thus, a minimum of cutting is done on the sides of the slots.

To achieve necessary die-hole taper on the slots, the mandrel cen-

ter is placed out of alignment to the required amount.

TO ASSEMBLE THE RINGS

In preliminary planning of the tool-building procedure, the press-fit allowance for the rings was considered. At assembly, the two rings are fitted together with great care to match the top and bottom half of the slots, Fig. 5. When pressing is completed, if any protrusions are found at the joint, they are carefully removed by oilstoning.

The upper tool consists of a ring of punches. These punches may be assembled in the punch plate or bolster, in correct alignment with the slots and anchored.

Another method of securing the punches to the punch plate is to produce a holding jig, which is slotted to accommodate each individual punch in correct position and alignment. While the punches are held in position by the jig, Cerromatrix or other low-melting-point alloy can be run all round in wells prepared to receive it.

TOOL INSPECTION

One other requirement is necessary: to prove the accuracy and efficiency of such a tool.

Inspection of such a tool is not merely a matter of taking measurements. The finished tool, or assembly, must be looked at from the standpoints of efficiency and function. In the first place, the inspector should be satisfied with the general appearance of the tool, that all flat faces or edges are flat, and that attention has been paid to the fit of the punches. This fit should be equal in every slot. The ideal sought is that all the slots be of the same size, truly radial, and equally spaced.

To be sure that every slot is of the same size, a slice off a punch will make a good check by trying it in every slot. Some engineers prefer a special punch for proving the slots.

When produced as described, the slots should have the correct pitch. But to prove the slots, ball-pointed trammels can be used as a comparator. Or if in construction of the tool, a bore on a known pitch circle is produced, then a gage can be made to check radial location and pitch.

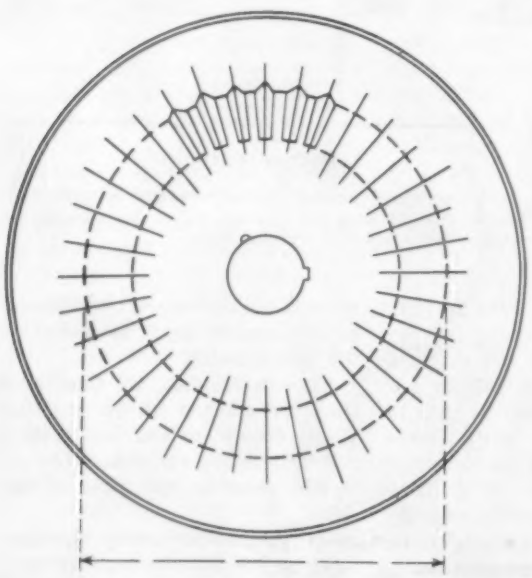
Despite close attention to good toolmaking and inspection practices, certain points about the tool may be brought to light during tryout. It is not unusual for certain conditions to prevail, which cause the tool to be modified, making the tool wrong, in order to make the right product. Much depends on parallelism, squareness, clearances, cutting propensities, the annealing of the metal being cut, and the uneven thickness of the material to be cut or formed. A qualified toolmaker has learned about these difficulties from experience and can avoid them.

MEASURING THE TOOL

The majority of inspectors and toolmakers will settle on the OD for reference purposes. It will be obvious that the inspector will have to check the diameter with a ball-ended pin gage, Fig. 6. This ball-ended pin gage is serviceable only when there are an even number of slots. If the specification calls for an odd number of slots, then the gage end must be changed to a point instead of a ball. This gage is set up for the distance between two points directly opposite —the fitting diameter to the apex of the slot.

To measure the inner ring, the member is put on a mandrel and placed between centers, as it was when being roughed out, the carrier being held to the dividing head. When the correct plate is attached, and the grinding unit is placed in its appropriate position and indexed, the bottom of the slot is proved to be in relation to the center of the mandrel.

Finally, the full templet or gage should be able to confirm the correct size of slot.



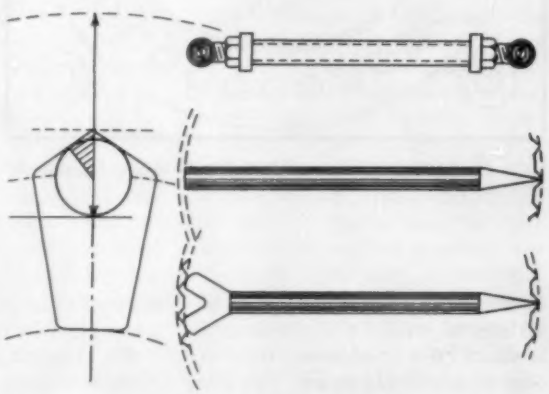
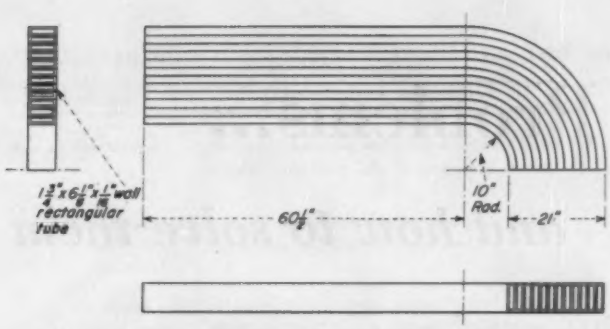
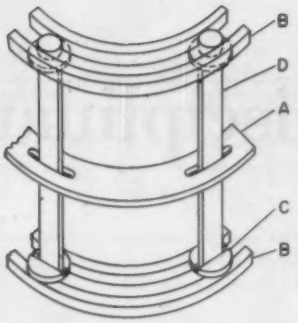
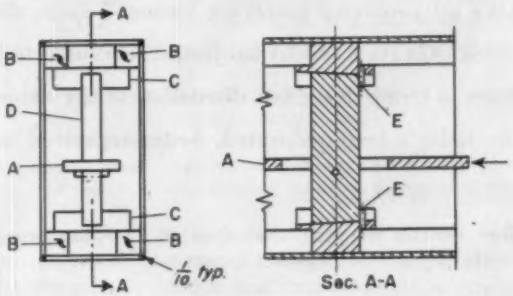


FIG. 5—Allowance for a press fit having been made, the two rings are assembled. Supreme test of good die-making is whether all the slots and apexes join smoothly. **Fig. 6**—Both an odd and an even number of slots can be checked for diameter with these gages. By solving the triangle shown, the double-ended ball gage can be used, where slots are diametrically opposed.



Tube assembly is made from stainless sheet . . .
because of stringent requirements on uniformity of walls





Tube-welding mandrel collapses . . .
when operator hits center bar *A* with a hammer

Ingenious mandrel solves welding problem

This collapsible device locates the parts and serves as an inside chill bar for welding up the corners of rectangular tubing

CHESTER SZYMKO, Central Shops Welding Supervisor, ARGONNE NATIONAL LABORATORY, LEMONT, ILL

When an assembly of rectangular tubes had to be fabricated for an experimental, liquid-metals pump system, Argonne National Laboratory tried, first of all, to bend rectangular tubing. However, the metal thinned out during bending and would not meet the stringent specifications on wall thickness. Therefore, each tube had to be welded up from the appropriate shapes cut out of 0.062-in. stainless sheet.

Straight tubing wouldn't have been so difficult, but these tubes, combining a radius and a straight leg, required a special mandrel for locating the sides and the top and bottom pieces. Adding to the problem was the difficulty of withdrawing the mandrel because the tube would shrink during welding.

To solve these problems, a collapsible unit was designed with a long copper bar (*B* in the sketch above) along each corner of the curved rectangular tube to locate the parts and to act as a chill bar.

The width of the tube was established by shoulder spacers *C* inserted between the copper bars at equal intervals around the curve. Height was fixed by eight vertical bars *D* whose ends were machined to match tapered grooves on the shoulder spacers.

In the setup for the welding operation, two of the copper bars were placed on the bottom piece of the tube, and eight shoulder spacers were spotted around the curve. Then the eight bars *D* were placed in the tapered grooves of the shoulder spacers and against the stop pins *E*. Next the slotted center bar *A* was installed, sliding it down over the vertical bars. Then the top of the fixture was completed by placing a shoulder spacer on the top of each bar *D* and the two copper bars *B* on their shoulders. Finally, the sides and top of the tube were clamped in place.

Copper chill plates were formed to the outside faces of the tube, and the whole assembly was held together with box clamps. Then the corners of the tubing were Heliarc-welded with inert-gas backup inside the tube.

After welding, the mandrel was collapsed by hitting the end of center bar *A* with a hammer. This forced the eight vertical bars *D* out of their wedged-in positions, and the whole fixture was free to be removed from the tube.

The first tubes of the series to be welded were those with the largest radius. The curved copper chill plates, both internal and external, were then rolled to correspond to the tubes with the next smaller radius. To weld the straight portions of the tubing, the design of the mandrel was changed only by substituting straight bars of the desired length for the curved copper bars and the center bar.

Two of these units were fabricated concurrently, and, once the operator became familiar with the operations, the work progressed rapidly. The completed tubes were tested with a helium leak detector, and, in a total of 9,000 in. of welding, only three small leaks were found and subsequently sealed.

Argonne National Laboratory is operated by the University of Chicago for the U S Atomic Energy Commission.

14 Disciplinary Problems...

and how to solve them

Like all problems involving human beings, discipline can be very difficult to enforce. Always a touchy subject, discipline is today an area where management often fears to tread. Here is a discussion of the subject, with suggestions on how to handle today's better-educated, better-organized worker

ERNEST W FAIR

One of the biggest headaches in modern plant management, particularly at the foreman's and supervisor's level, is the maintenance of discipline. The prevalence of old, hard-to-change routines makes this the major problem in many plants.

Because of legal and social changes that have recently developed in our society—particularly with respect to labor forces—discipline itself has acquired an entirely new meaning. Methods successful only a year ago may be as obsolete today as a buggy whip on an automobile.

Every investigation into disciplinary programs has disclosed that success today depends on intelligent use of four methods: reprimands (oral or written), layoffs, demotion or undesirable transfer, and discharge. Where union contracts exist, these methods are sometimes placed under such restrictive controls that management is left helpless. Such cases are rare, however, for union officials generally cooperate in the use of these means of disciplining offending employees.

Each of the four methods of discipline requires careful use. Reprimands, to cite the first, must be given with tact, understanding, and the utmost emotional control by the supervisor or executive. The recourses of the individual employee today are too great to let emotion sway any situation. This control is of particular importance in oral discipline. We tend to become more emotional with the spoken word than we do in the "bawling out" put into writing.

Layoffs are sometimes the only method of disciplining certain individuals, but they also penalize the firm, particularly where a skilled worker is involved. Layoffs can usually be short, yet still effective, for with today's high wage schedule the amount of money missed in a single day's wage can be very, very important. This penalty is often the most effective one that we can apply.

Demotion or transfer to an undesirable post in the plant is another good modern disciplinary technique. Actually, if employees know definitely that this will be the penalty for a breach of discipline, they are much less apt to be careless than where no such formal notice has been given. This discipline should be resorted to only as a secondary action, for it is a stiff penalty to impose where an individual has had a single lapse or where forces beyond his control have brought about the offense. It is an excellent way to handle chronic offenders.

Discharge, which is of course the most severe penalty, has to be examined from every possible angle before it is invoked. Where union contracts exist, it must conform to regulations within those contracts, or be carried out with the cooperation of union officials, to give the administration assurance of no reprisals from this quarter. It must also be remembered that the average employee costs a good deal to train. If he is dismissed, a new man must be trained, usually at great cost, to take his place.

Where discharge is involved, the degree to which a particular worker is penalized should be considered. In some areas there will be no element of penalty whatsoever if his skills and services are in great demand, for he can immediately find a job elsewhere.

APPLY POSITIVE CORRECTION

It is generally recognized today that one of the best disciplinary procedures that can be used in any plant is to apply positive direction that corrects by showing the right way. Any executive who applies such thinking will be amazed at how much more readily he receives the cooperation he desires, in contrast to results with the old "negative" methods based on the "Thou Shalt not" principle.

Most employee actions that require discipline arise because the worker does not know proper procedures. A full explanation of his error should always be the first step taken. Only after it is apparent that the employee definitely does understand the positive aspects of the action should other, more severe steps follow. This counselling will greatly reduce the management problems in any plant.

It has also been found that it is not wise today to restrict or set back the employee being brought into line. Once this was an excellent method of discipline, in the

Most common disciplinary problems and solutions

Problem	Disciplinary Action
1.. Absenteeism	Personal talk: seek and remove cause, create greater interest in job. If continued, dismiss.
2.. Dissatisfied with work conditions	Look for jealousy, favoritism; apply better job instruction; transfer to other work.
3.. Sloppiness about work area	Personal talk: impress safety hazard, allow clean-up time. Check supervisor's strictness.
4.. Disloyalty	First seek cause and if possible remove; if no results, dismiss.
5.. Chronic complainer	Check for cause and remove; more recognition by executives of work done often handles problems. If no results transfer or dismiss.
6.. Excessive talking on job	Impress how this bothers others and is possible accident hazard; break up "buddies"; put on isolated job.
7.. Insubordination	If personal, transfer to other post; if part of basic character, dismiss.
8.. Ignoring safety practices	Personal talk, make clear hazards as they affect the individual; transfer to where less hazards exist.
9.. "Horseplay" on job	Personal talk, show safety hazard; get group to self-discipline individual for their own sake; allow "break" time.
10.. Poor quality of work	Give personal added instruction; as penalty, order work to be done over. If continued, transfer where work is satisfactory or dismiss.
11.. Rumor spreading	Personal talk, seek basis and try to correct. If vicious, dismiss.
12.. Quitting ahead of time	Personal talk; correction on time card; if continued, salary reduction; if chronic, dismiss.
13.. Soldiering	Firm and decisive personal talk; add other duties until stopped; if continued, dismiss.
14.. Theft	First time check reason and try to solve. Subsequently, turn over to local authorities for routine action.

days when educational levels were low and the average man had far less understanding of the world about him. In our age restrictions and setbacks tend to depress the employee and make him even more liable to the need for further, more drastic discipline each time he breaks the rules.

Today's executive, foreman, or supervisor must never forget that employees often do not think logically, and that their actions are governed in great part by their sentiments. He must always direct his disciplinary efforts with these facts in mind.

Many executives are also finding that disciplinary troubles become less and less a problem in their business when disciplinary education is made a part of job-training programs rather than given as a separate (and usually brief) orientation. Where discipline is made an integral part of every job-training setup, it is accepted by the individual as part of the routine he is to follow. It is never "something extra."

Another phase of modern disciplinary practice is greater recognition by management that when the average employee believes management has no interest in him he is unlikely to respond to normal disciplinary measures. The more interest shown in the individual by everyone above him—from his immediate supervisor to the top executive in the firm—the greater will be his interest in his work and in conforming to established procedures.

Such interest in employees is today recognized as a must in plant administration and management. The human side of the employee is of such greater importance than formerly that it cannot be ignored. The days when employees were just "workers" or so many names on a payroll have definitely passed. Of course old principles should never be forgotten in any modernization program; rather, we must retain the merit in the old and discard those aspects that our modern age has made obsolete.

MAKE DISCIPLINE CONSTRUCTIVE

No one is perfect, so we must have discipline. But today it should be the kind of discipline from which the employee learns, and it need not always be bad. Yesterday discipline was usually bad—from the employee's viewpoint. Applied with modern methods it becomes helpful.

Application of the foregoing principles should be made with these thoughts in mind:

1. Greater care must be taken with discipline today, because workers have more power than in the past.

2. Rules should be fewer in number, and some things should be left to the good sense of the employee, who is better educated today.

3. Rules should be presented positively, not negatively.

4. No disciplinary rules should be set up unless the practical reason for the rule is given.

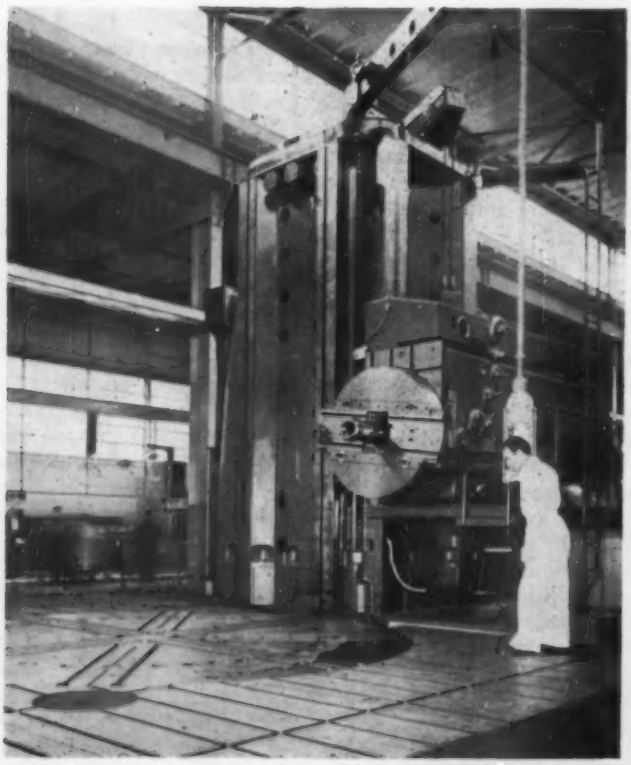
5. In modern business with its well-educated employees, there can be much more self-discipline today than ever before.

6. Automatic punishments should be eliminated insofar as possible. Each breach of discipline should be considered and judged on its own merits.

Two problems hit builders of large equipment: Any time the setup is changed to allow a different machining operation, there is a loss in accuracy. And setup time often exceeds machining time, so costs soar. The answer has sometimes been to bring the machine to the work—and leave the work in its original setup. Now Innocenti-BWM of Italy has developed a complete "building-block" plan for an oversize machine tool that will do practically any kind of machining with a clever selection of heads, slides, and tables that fit onto a standardized vertical column

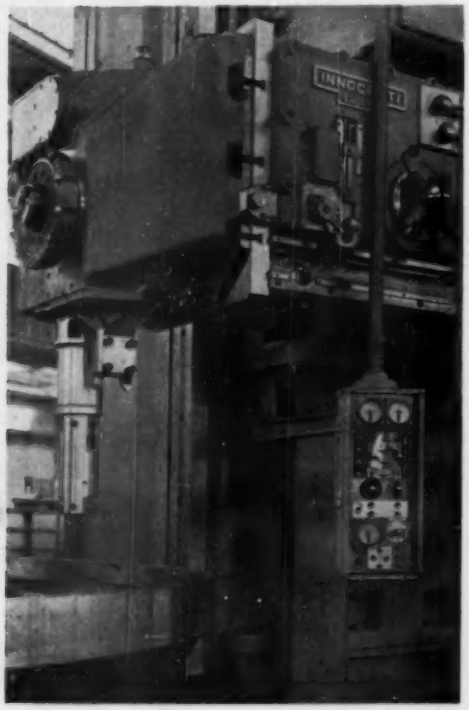
Rotary table is one basic element of Innocenti plan for building up a special machine tool for huge workpieces. Unit has stepless rotational speeds up to 148 rpm, may be locked in any position, and can be indexed within accuracy of 2-10 sec

"Building-Block" Approach Builds More Accurate "Elephants"

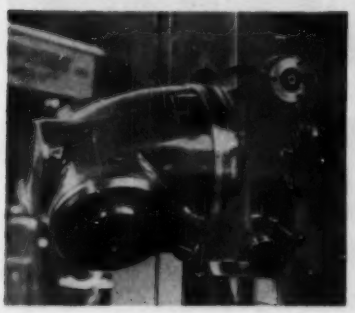


Vertical column has precision ways on two faces, to which can be mounted extra powered heads and tool mounts. Rotary head is adapted for boring here, but may also do milling. Note rotary table, inserted in wide flat T-slotted baseplate on which heavy work may be located for many successive operations

Powered head has vertical and horizontal spindles with 40 hp and speeds up to 640 rpm. Wide support faces allow adding various attachments that will remain rigid in spite of overhang. Feed motions range from 0 to 15 ips. Note boring toolblock on under side of head, next to vertical spindle

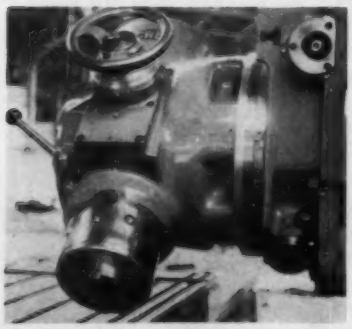


Alternate head attachments include three-way head with longitudinal and right-angle spindles,

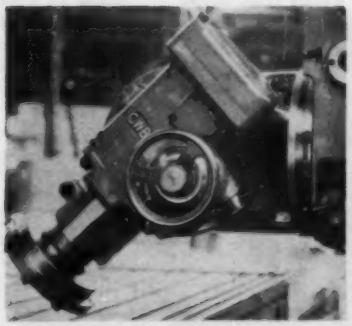


...One-way right-angle head for boring and routing,

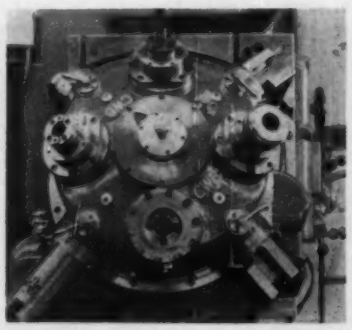
Rolling-mill housing is machined on five faces with universal head that can cut in any plane. Transverse motion can be obtained by powering the head or by locating work on planer-type table. If back side of work must be machined (as well as ends), it can be mounted on rotary table and be indexed around as required



...Universal adjustable head that will machine slanted surfaces.



...Universal automatic head with adjustable power feed, and



...Turret head with four vertical and four horizontal spindles

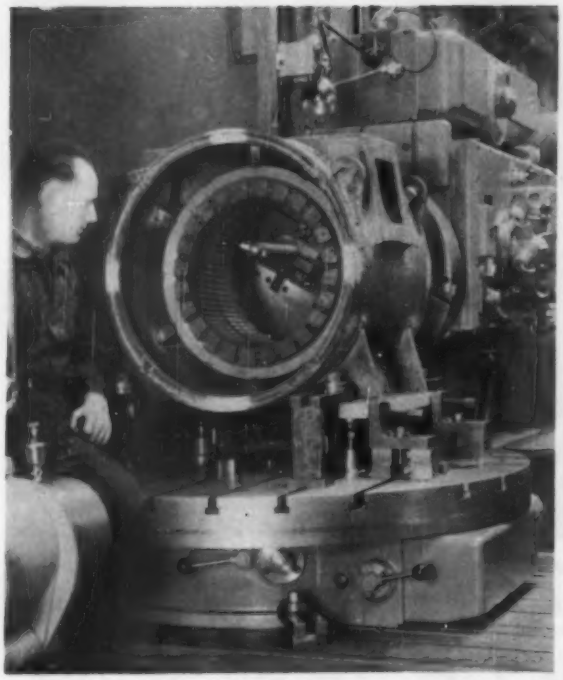
(Taken from a lecture by ING PAUL AUBRIER, Innocenti Mech Div, in Milan, Italy)

In one respect, at least, the relative size of a workpiece has great effect on the methods by which its production can be speeded up and made more accurate. Small and medium-size components can be handled on mechanized and automated machining lines, but really large parts cannot. The simple fact of size is one main difficulty; and another is the fact that few large parts are produced in quantities big enough to justify mass production.

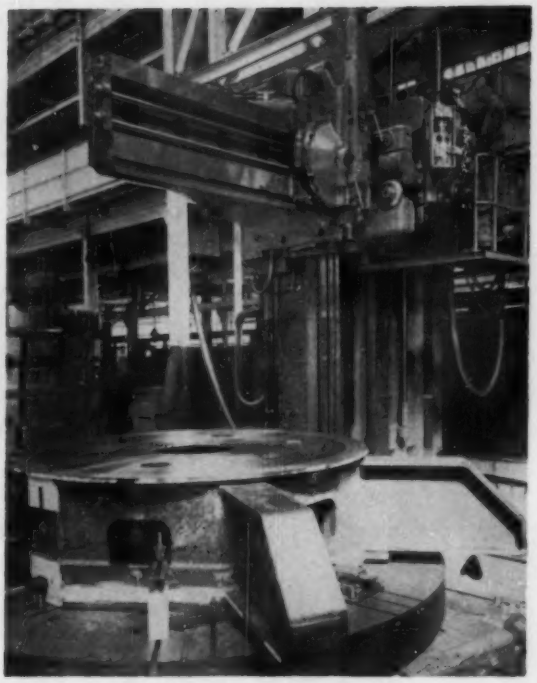
The best principle to apply for large parts is to set them down in one spot where they can be machined, and never move them again until as much as possible of the necessary machining is completed. If the machine tool has the versatility to accomplish a large proportion of this machining, then both production and accuracy can be improved.

The Innocenti approach has been just this simple, although making the machine tool as versatile as necessary was an involved machine-design job. The result is a fairly expensive large machine tool, but one that has been successfully applied to large parts where its total cost is less than the cost of two or more conventional large machine tools.

There are a large number of attachments and fittings, all designed to do different machining jobs when applied to the basic machine. Most potential users would not require all attachments, but they are

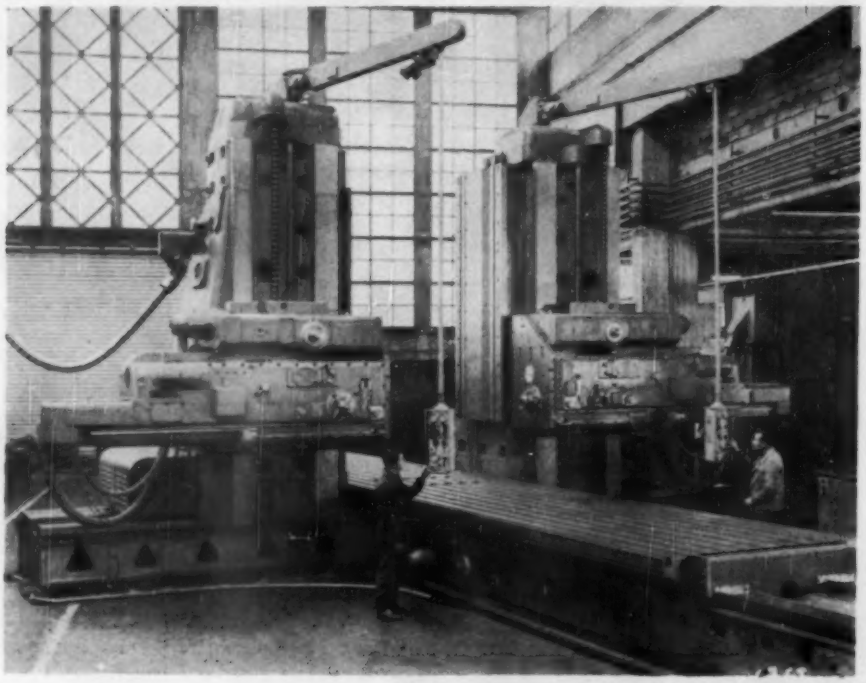


Slotting setup, with longitudinal table mounted next to stationary column, has here been adapted by adding a rotary table to support a motor housing to be bored out. Rotary table allows swinging work end for end to allow boring both end faces



Horizontal arm attachment clamps to vertical column to do precision boring. Swivelling ram is hydraulically balanced for smooth control, and has power feed. Arm proper is hinged to saddle that grips ways, and will swing back out of the way when other tooling is required

'Building-block' approach builds more accurate 'elephants' . . .



Double machine will work on caterpillar-tractor bodies, machining vertical surfaces; and boring, milling, and drilling. Both columns are to be equipped with turret heads with six spindles. Cycling is automatic, controlled by drums with adjustable stops. Table can be positioned within 0.01 mm

available if a fabricating job demands them. Considering all these attachments, the machine can work several or all sides of a large workpiece as well as many internal surfaces, and can machine in any direction that may be required.

The basic parts of the machine are these:

A large vertical column with wide ways on two faces, to which can be mounted a number of slides and attachments

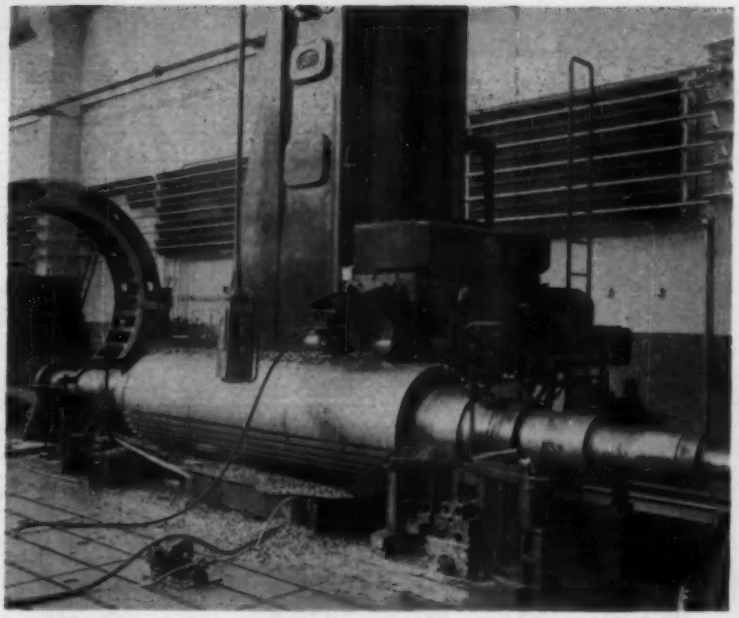
A powered rotary table capable of holding a large piece of work, and also capable of indexing or angularly locating the work

A primary powered head that fits the vertical column and which has tool spindles aligned in two directions

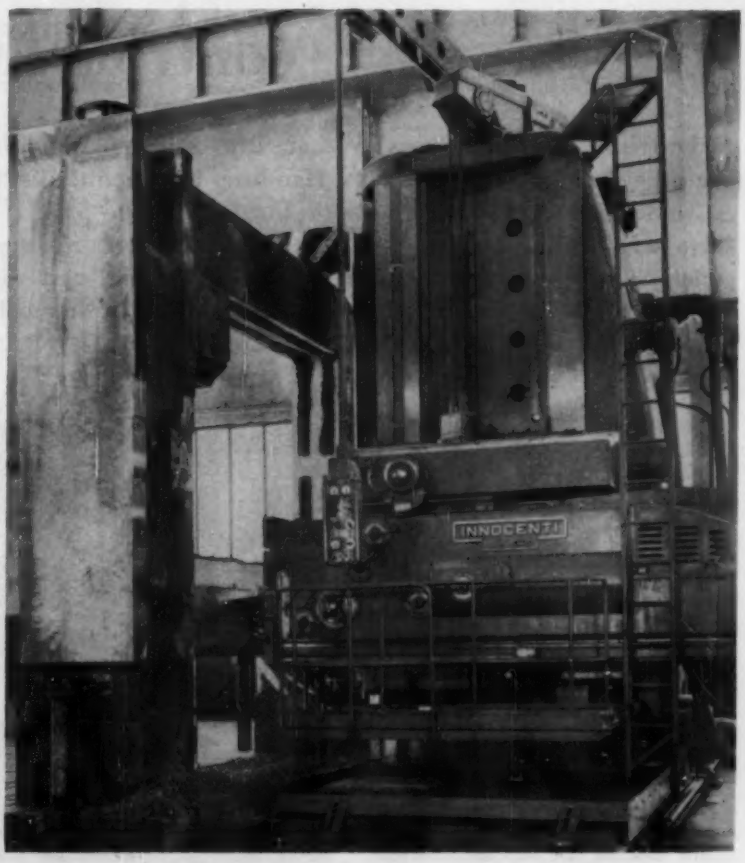
In addition, there are various cutting heads, a reciprocating table, a large T-slotted baseplate that fits around the rotary table, and a special head with horizontal ways that can be extended over the work

With this array of tooling facilities, it is possible in many cases to locate the large workpiece on a table in the position in which it will eventually be operated—a good point because this location will minimize distortion in the work and will not introduce unexpected stresses. The work may not have to be moved at all, until machining is completed, which saves setup and handling time—big factors when the work is quite large. The machine can be—for all practical purposes—built up around the work as required. One attachment may be used, then another put in its place to machine a different surface.

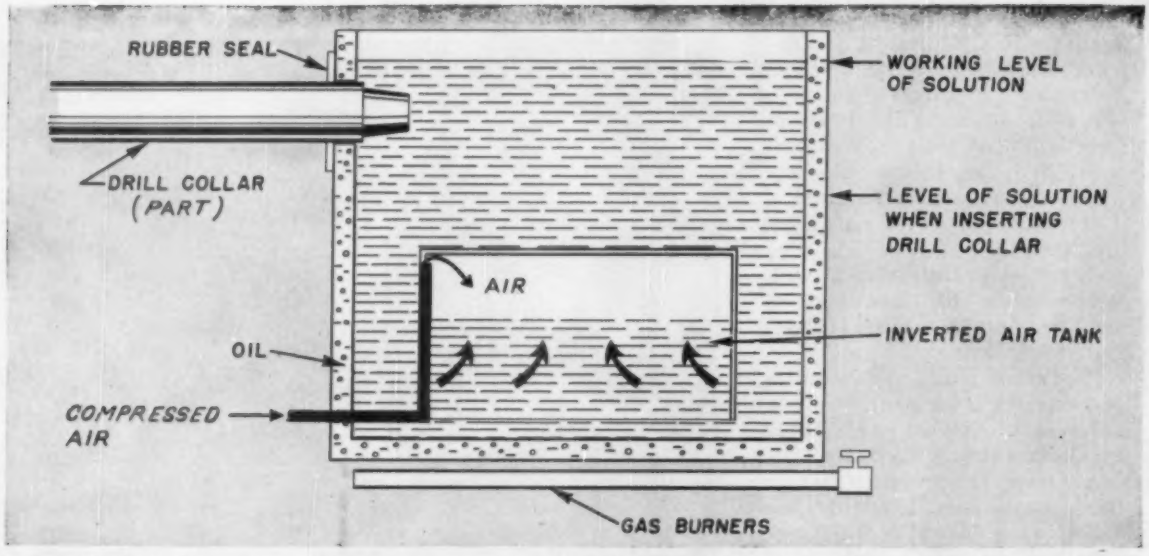
Any cutting tool applied can be adequately driven. Headstocks have 25, 40, or 60 hp, and feed motions are stepless from 0.6 to 2200 mm/min. Controls are in a pendant box.



Special cutter on standard power head cuts grooves down length of heavy generator rotor, which is set up in this case on floor blocks. Column itself has been mounted on longitudinal baseplate to allow travel. To allow turning at same setup, work may also be swung on centers



Standard operation for a horizontal boring, drilling, and milling machine can also be handled, as here on a heavy built-up section for a rolling-mill housing. Rotary table acts simply as part of the work-mounting base



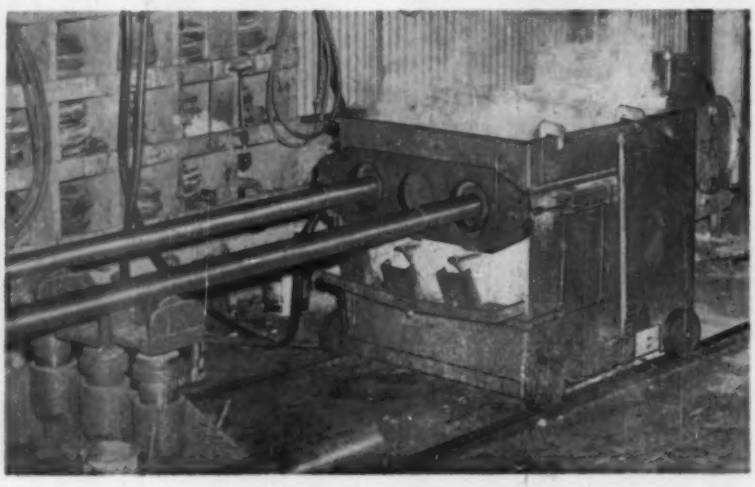
Inverted air tank . . .
holds approximately one-third of the fluid capacity of the main tank. After part is placed in tank, air at 100 psi is released into inverted tank, thus forcing fluid out and causing fluid level in main tank to rise above part. After treatment, exhausting the air lowers the solution and the part is removed.

This tank, designed to apply manganese-phosphate anti-galling solution to oil-drill collars, consists of a stainless-steel tank suspended within a steel shell. The space between the inner solution tank and the outer shell is filled with high-flashpoint oil which is heated by burners beneath the tank. The hot oil maintains the solution at 200 F

Inverted air chamber controls fluid level

Frequently it is necessary to coat, dip, quench, or lubricate unwieldy or massive parts. Handling is difficult. Just as it sometimes is practical to take a machine to the part, it is also sensible to take the fluid to the work. Here's a simple trick to use with coolants for immersed cutting, and with quenching oil, primers, phosphate coating, and other solutions.

E E RUBAC,
executive vice president
AMERICAN IRON
& MACHINE COMPANY, INC
OKLAHOMA CITY, OKLAHOMA
(a subsidiary of
American Machine & Foundry Co)



Two drill collars . . .
enter the mobile tank through sealed ports on its side. After the parts have been inserted, a flat air-operated plate is retracted to compress the rubber seals in the holes and assure a leakproof fit. Tube bores are plugged before placing them in the chamber. Compressed air released into a tank submerged in the bath displaces the solution, raising its level until the tube ends are immersed

Round Table...

Looking Ahead— for Manpower

"I think I've got a good idea how we can pick out good future mechanics for our shop, Ed. We ought to have a man from our plant go over to the local trade school and help out with the kids once a week."

"Sounds like a fine charitable thing, Al; but nobody around this management's going to allow it."

"Maybe they will, Ed. If we let a good experienced hand go over there to give special instruction and pointers, say one afternoon a week; he could pick out a few likely youngsters that we could hire come graduation."

"That's likely to get the other plants in the area mad at the school, and at us. It wouldn't be good public relations, Al."

"It might help the youngsters, though. Maybe our man wouldn't have to send us all the boys he could, but it would sure help if he could steer good potential mechanics into the right kind of training."

"The regular teachers at the school do all the steering they can, Al. We get our fair share of apprentices. Besides, I don't think the school authorities would much like it if we started to meddle in their business. We wouldn't put up with them around here."

"Look, Ed; it would be a help to them. You know as well as I do that a high-school instructor has his hands full looking after a room full of boys working with machines. I'm sure the school would be happy to get help. Our man would really be contributing practical experience to the boys' training."

"Sure; maybe our man would like teaching so much we'd lose him."

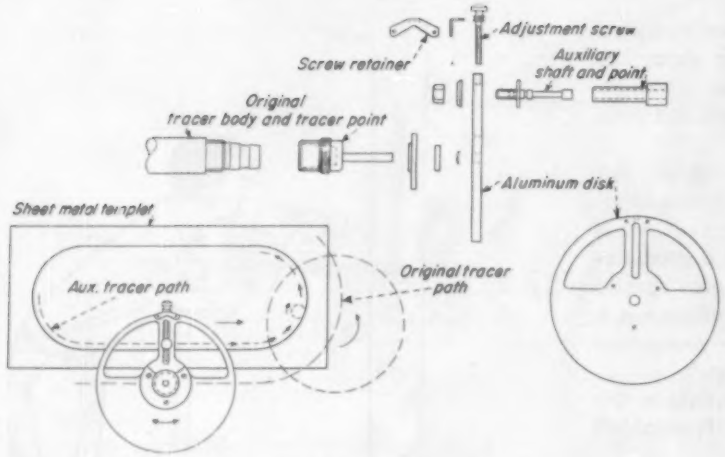
"So what? It would be good for us in the end—better training for new apprentices."

"Just because a man's practical doesn't mean he can teach at all, Al. And another thing; we need all the experienced men we can find, and Harrison would never OK losing half a man day each week. He wouldn't care about how much good it would do eventually; he'd just worry about our production tomorrow."

"I suppose you're right, Ed; but maybe that's just the reason we should fight for something like this. If he's not going to worry about the future, who is? We have to get new men somewhere; and they have to be trained—better than ever, nowadays."

• • •

***HOW MUCH** should industry cooperate with local schools—for its own good? Is there any advantage in Al's idea? Your opinions may help others with this problem. Discussions of earlier topics start on page 166*



Auxiliary Tracer Point Cuts Cost

We had to make a large tub-shaped plastic mold. The usual procedure would be first to make a master templet out of cement or plaster of paris, then transfer the contours onto the die block utilizing a profiling tracer or what have you. However, the size of the job in question was straining our capacity.

With an aim to cut the cost of a plaster templet, and at the same time simplify future setups, an auxiliary tracer assembly was built. Provisions were made for adjusting the degree of taper as the depth of cavity increased. The whole assembly was mounted on a standard tracer point via a pressed fit into a small ball bearing.

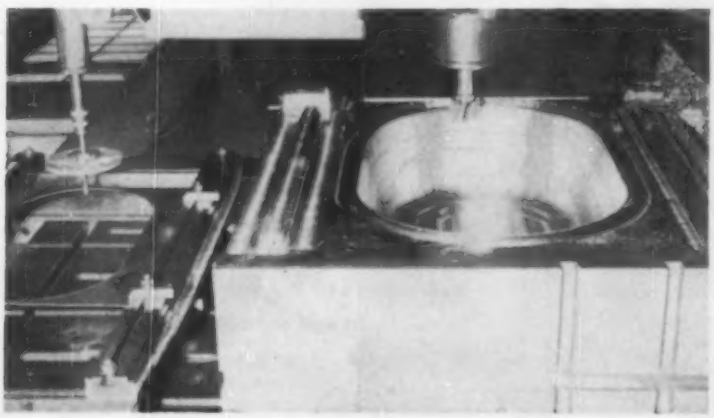
Aluminum was chosen for the disk and for as many small parts as possible, because weight was an important factor. The 6-in.-dia disk was cut from ¼-in. thick material and machined as shown. The center hole had clearance for the tracer point and a slot was milled for the auxiliary point with a thread leading into it for the adjusting screw. Two quadrangular ports were cut out of the disk, one on each side of the slot, to help balance the disk when the parts were assembled.

The retainer cup for the ball bearing had a section cut away to permit the auxiliary tracer to be set as close to the original point as possible. A small arched spring-retainer washer followed the bearing on the tracer to prevent the disk from dropping off.

The auxiliary point was made in two main parts: the spindle and a revolving point. A small pin locked the two parts together. The spindle was drilled and tapped to receive the adjustment screw, and the upper part was threaded to make a locking nut. A piece of sheet metal was bent at right angle and formed as shown. The forked end fit the groove in the screw, and the other end fastened to the underside of the disk in such a way that backlash would be at a minimum.

The sketch at the left bottom shows a typical setup. Note the path of the original profiling tracer. This is the path taken by the cutter on the work. Shown also is the auxiliary tracer point following a simple sheet-metal templet. The same templet is used throughout the entire job. The only change necessary is that of adjusting the distance between the auxiliary tracer point and the original.

Carlos Perez, Lago de Texcoco, Mexico



Suction Cup Speeds Loading

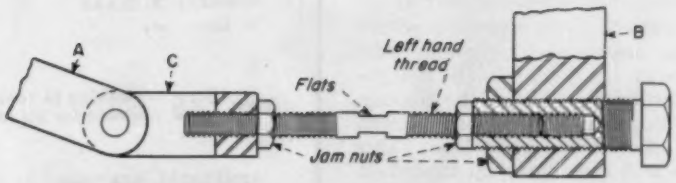
When second press operations are necessary it is desirable to cut manual feeding time to a minimum. This we have done with a small rubber suction cup mounted on the end of a wooden handle.

Loading is done by holding a stack of blanks in one hand. Slapping the suction cup down on the top blanks picks it up, it is then nested in the die, a slight twist of the wrist breaks the vacuum, and the blank is loaded.

A tapered wooden stick, about 10 to 12 in. long, makes up the handle. The suction cup is of the type used for holding accessories to bathroom tiles. A hole is drilled through the small end of the stick and the suction cup is cemented into it.

An advantage that may be worth mentioning is the fact that this pickup tool has no metallic parts, and can therefore not damage a die should the press be accidentally tripped.

E P Baker, London, England



Left-Right Threads = Fine Adjustment

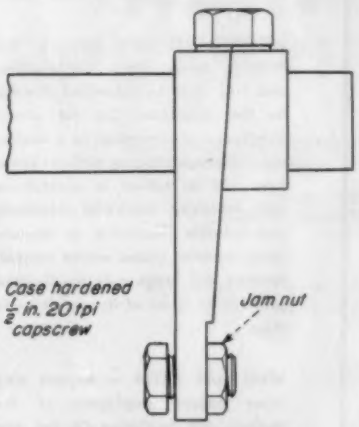
It is sometimes an absolute necessity to provide a fine adjustment on linkages connected to cams or other moving parts, especially in cases where compensations for wear must be made. The sketch shows a typical application with a simple but effective adjustable linkage.

The main connecting link between the two main parts, A and B, is a 5/16-in. rod. One end is threaded right-hand 18-tpi, and the other left-hand 18-tpi. The center part of the rod has two opposing flats for a wrench to make coarse adjustments. A fine adjustment screw is produced by deep drilling and tapping a 5/16-18 thread in the center of a piece of hexagonal stock. The OD is then turned to ⅝ in. and a 32-tpi thread is cut on the full length of the body.

Two 5/16-in. jam nuts, one left-hand thread and one right-hand, lock the rod. A ⅝-nut is used for locking the fine adjustment screw. A right-hand 5/16 in. thread is tapped into the end of the clevis C, and part B is drilled and tapped ⅝-in. 32-tpi for the fine adjustment screw.

After all parts have been assembled and the rod roughly adjusted, the locknut on the clevis is tightened. Fine adjustments are then made by turning the ⅝-in. screw clockwise to increase the span, or counter clockwise to decrease it. When desired length has been found, the 5/16-in. left-hand nut is tightened, as is the ⅝-in. nut.

Cliff Bossman, Dayton, Ohio



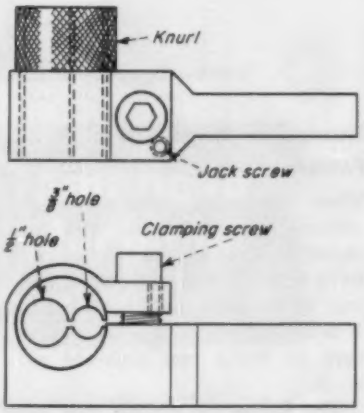
Micrometer Adjustment For Screw-Machine Stop

When setting up with the swing stops in our B and S 2G screw machines, it was always difficult to secure the stop exactly where wanted. To quickly and easily establish this setting we modified the stop by installing a ½-in.-20 capscrew. This enabled us to approximately set the stop with a scale, then by adjusting the screw we get micrometer accuracy. One turn of the screw represents 0.050 in. and each flat is equal to 0.0083 in. increase or decrease.

After annealing, the swing arm stop was altered by milling a flat on the back, parallel to the front face. This was done to give us a landing for a jam nut. A hole was drilled and tapped (½-in.-20) through the end of the stop, perpendicular to the landing. The arm was then rehardened.

A ½-in.-20 capscrew, ¾ in. long, and a ¼-in.-thick jam nut were given a deep case hardening and assembled on the arm as shown. If calibrations are desired, the screw head can be turned before hardening to remove the six flats. Fifty 0.001-in. graduations can easily be marked on the head periphery by chucking the screw in a dividing head, and graving with a tool held in the spindle.

Arthur W Petree, Green Ridge, Pa



Adjustable Boring-Bar Holder

In our specialized field of manufacturing spray nozzles and their relating components, small boring tools are in constant operation. As a result, boring bars and boring form tools have to be interchanged often. To reduce worker fatigue, and to eliminate numerous holders, the illustrated tool was designed.

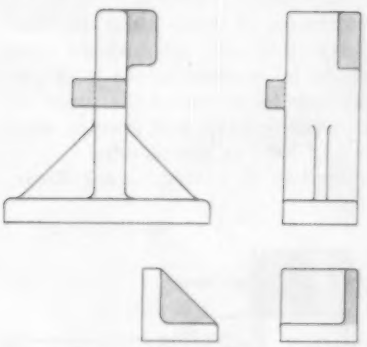
Two holes are machined through a clamping plug to take standard ½-in. and ⅜-in. shanks. The OD is turned to fit the bore in the holder, and the larger diameter extension is knurled for a better grip when centering the boring tool. A saw cut is made through the ⅜-in. hole and into the ½-in. hole, leaving one wall thickness intact.

A socket-head capscrew does the clamping, and a small headless setscrew is used as a jackscrew to release the plug if necessary. For boring tools with intermediate and smaller size shanks, a split sleeve of proper dimensions is first inserted into either hole.

The shank of the holder shown is straight to make it more solid but can be made with a bend if so desired.

Paul Cox, West Des Moines, Iowa

Practical Ideas



Shaded Tracings Cut Pattern Cost

When designing components for various types of tools and machines it is sometimes necessary to have a right- and a left-hand casting. This means that if the casting is not symmetrical it will be necessary to make two separate patterns.

The following method can save considerable time and money in the pattern shop, especially where large, heavy machinery and their patterns are involved. The designer shades the back of the tracing, denoting the parts of the pattern that should be made loose. This area will then show up shaded on any print made from the tracing.

Thus, when the pattern maker receives the print, he knows immediately which pieces must be loose. In addition, this system is efficient from a drafting-room standpoint. The tracing is filed, and at any time when the particular pattern must be used again with slight alterations, the engineer can see at a glance what pieces are loose and to what extent he can change it without undue expense.

The shading is done on the back of the tracing because if it ever becomes necessary to erase or change the shading it can be done easily without erasing any of the other lines on the drawing.

Roger Isetts, Kenosha, Wis

Do's and Don'ts for Machine Taps

Do . . . use sharp taps. Dull taps bind and break, and will produce rough and torn threads.

Do . . . keep a generous supply of cutting oil on the tap during tapping operation.

Do . . . drill blind holes deep enough so tap will not be broken by hitting bottom or accumulated chips.

Do . . . use sharp tap drills. Dull drills work-harden the hole surface, affecting the tapping operation.

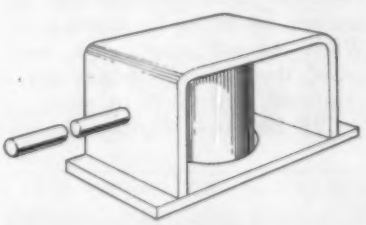
Don't . . . use worn-out tap holders. They cause oversized and bell-mouthed holes.

Don't . . . force or retard a tap when starting a thread. Cross threads may result.

Don't . . . try for 100 % full thread. A 75% deep thread is adequate.

Don't . . . tap holes out of alignment. Misalignment causes tap breakage and torn threads.

Frank L Rush, Columbus, Ohio



Magnetic-Indicator Base Made From Speaker Magnet

We had several kinds of indicator holders, clamp-on and others, but were lacking a magnetic-base holder. I needed one right away so I set out to make a substitute. After some searching I found an old permanent-magnet speaker that was worthless except for the magnet.

The magnet and its housing were removed from the speaker frame. A small hole was drilled and tapped for a length of rod to suit my indicator. The arrangement shown in the sketch satisfied my needs, but the rod can, of course, be located wherever it's most convenient, in an upright position or at an angle.

L A Christie, Culver City, Calif.

MICHAEL P BLAKE
St. Louis, Mo

won $25 in addition to regular payment for his idea:

SPHERICAL SEATING BORING BAR

In the May 20, 1957 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

Our annual Production Planbook will reprint all winning ideas as a review. One will be chosen out of this issue as a winner of winners, and will receive a

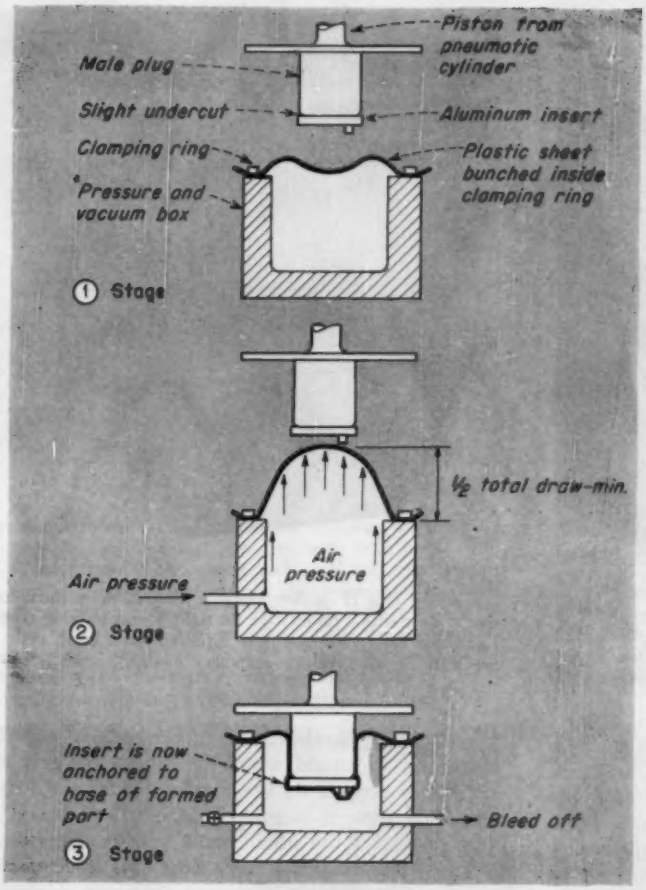
GRAND PRIZE OF $100.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N. Y.



Blow up, reverse snap-back method

HOW TO THERMOFORM PLASTIC SHEET

EDWARD F BACHNER JR, manager, CAMPCO, a division of CHICAGO MOLDED PRODUCTS CORP

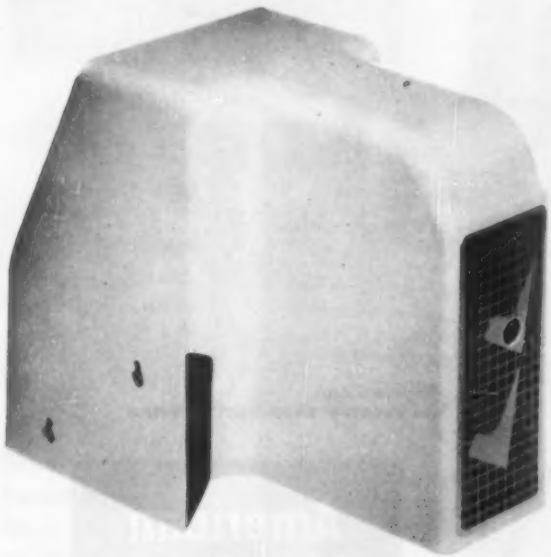
In collaboration with **JOHN P WRIGHT,** associate editor

COPYRIGHT 1957 BY McGRAW-HILL PUBLISHING CO, INC.
330 W 42nd ST, N Y 36, N Y

American Machinist
SPECIAL REPORT No. 447

Diversified applications of thermoplastic-sheet-formed parts are making many inroads into the metalworking industries. Among the most noteworthy applications are formed parts for precision instrument enclosures and custom-designed kits for the more difficult materials-handling problems. Because of the vastly improved characteristics of thermoplastic sheet, particularly in its strength, stability, optical clarity, moisture and acid-resistant properties, these sheet-formed-plastic parts are rapidly gaining acceptance over metal-formed parts. We have compiled data on methods of sheet-forming, mold design and considerations, and recommendations on when to sheet-form or mold.

Thermoforming plastic sheet . . .



Courtesy of Speck Plastics, Inc

Enclosure for an industrial camera . . . is an outstanding example of sheet forming intricate shapes. Material is 0.125 in. thick copolymer styrene drawn to a 9 in. depth with an opening 11 in. long and 5 in. at widest point. A good example of a large part for industrial use is the tote-box. They are 16½ x 24 x 12 in. deep, formed from 0.250 in. thick copolymer styrene with a rolled edge for rigidity and carrying purposes. Enclosure and tote-boxes were formed over a birch male plug using the blow-up, reverse-snap-back method

THERMOFORMING PLASTIC SHEET MATERIAL

Here is a general description of the various methods and materials employed by the fabricators of thermoplastic sheet materials. No attempt has been made in this discussion to provide an engineering manual. On the contrary, we are endeavoring to present in simple, common, non-technical language a discussion of the various sheet-fabricating methods now in general use. Our main objective is to provide a clear, general idea as to what can and cannot be done by sheet fabricating; when to recommend molding and when to recommend sheet fabrication.

COMPARISON BETWEEN FORMED AND MOLDED PARTS

Fabricators of plastic sheet are those who do heat forming, stamping, cutting, machining, color application, etc in either thermosetting or thermoplastic materials or both. In many cases the fabricator will have to bond or cement some other part or material to the formed part. It is quite common for fabricators to take on the job of producing a complete product. It should be clearly understood that the sheet forming of plastic parts will not take good molding jobs away from injection molding. On the contrary, the possibility of using forming for pilot runs will often serve to add to the number of molding jobs. True, there are some areas wherein the job might easily go either to forming or molding. Such cases, however, are comparatively rare.

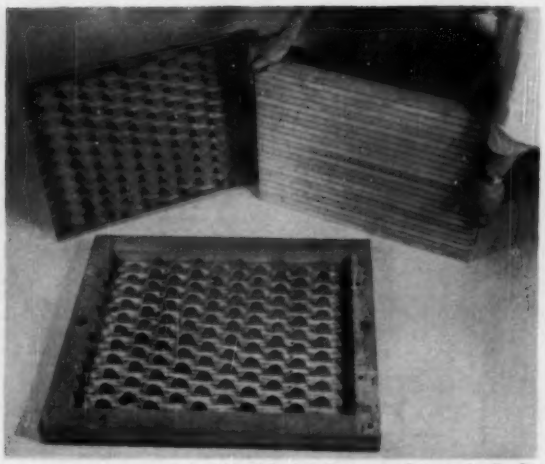
In nearly all cases, a careful analysis of the job will indicate clearly whether the piece should be molded or sheet formed. For example, it would be impractical to build a $5,000 mold for $1,000 worth of parts or a $15,000 mold for a $20,000 billing of a larger part. Jobs in these categories usually make good forming applications. The molder doesn't risk a loss on the mold which he would never have a chance to recover on the molded parts; nor does the customer have a large cash layout for tooling. The fabricator, on the other hand, can get the job into production in a few week's time at a fraction of the tooling costs.

In general, it may be said that the choice between molding and forming depends first on the design and wall thickness of the piece part and second, upon the economic factors involved. Does the application warrant the high cost of a steel mold? Can the customer spread the initial mold investment over a large number of pieces? If the answer to these questions is in the negative, obviously forming is the only medium which can be considered.

Let us assume that we have for consideration a compact instrument enclosure that would lend itself to injection molding. If the customer is planning on a minimum of 100,000 pieces or up, it should in most cases be molded, because the volume is sufficient to absorb the tool costs, material costs are lower, and supplementary finishing operations are minimized. But if we had a 5, 10 or even 20,000 run of the same unit, the enclosure should of necessity be sheet-formed or otherwise fabricated.

Many jobs of this kind will begin as fabricating jobs. Then once the market is thoroughly established, and volume requirements can be clearly foreseen, the job will switch over to injection molding.

All this does not mean to imply that all high-production jobs should be molded. Many such jobs, even of large quantity, are handled better by forming because of the engineering design, and size of part.

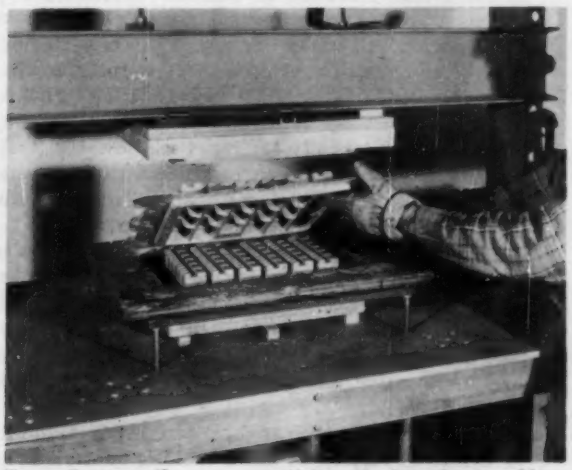


Courtesy of Product Engineering Laboratories Co, Inc

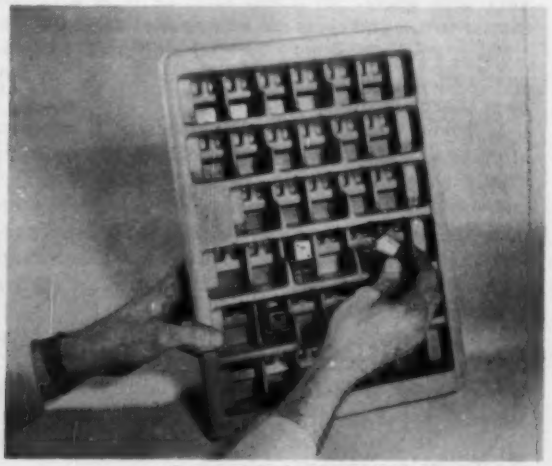
Low-cost molds . . . and simplicity of design are the main advantages of sheet forming. Mold is made from maple with the separators made from brass. Female mold uses only through slots equal in width to two material thicknesses plus thickness of brass separator. Formed tray, upper left, is 20 x 24 x 2 in. deep and is made from 3/64-in. butadiene-styrene-acrylonitrile. Although sheet thickness on sides of plastic separators is considerably stretched, separators nevertheless retain sufficient rigidity and strength to meet specified requirements

Courtesy of Product Engineering Laboratories Co, Inc

Mold inserts . . . are always locked in to position, rarely fastened permanently, as a precaution against mold breakage and to provide for design changes. For the same reason the entire mold is made-up of individual sections. As a design criterion, molds are built to permit the part to be formed from one-piece construction, and in one cycle, with a minimum of subsequent finishing operations. Sometimes it is possiible to fit a customer's part to a standard mold in stock



Deep-drawn ribs . . . are ¼ in. wide, 2 in. deep, on this materials handling tray used to nest relays. Tray was formed from 3/32 in. thick butadiene-styrene-acrylonitrile tripolymer which has high-impact strength to –40 F. This part is another



Courtesy of Product Engineering Laboratories Co, Inc

good example of sheet forming deep-drawn intricate shapes by the plug-and-ring method without any assist from air pressure or vacuum

HOW DOES A PLASTIC-SHEET-FORMER OPERATE?

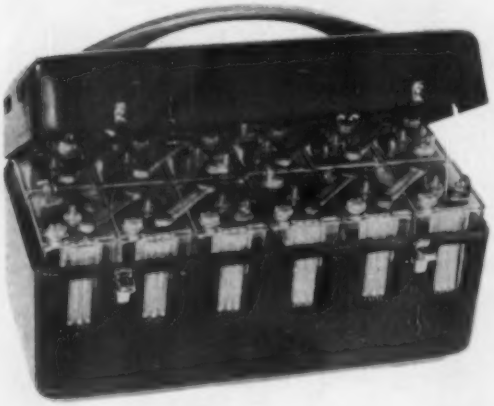
Plastic sheet forming is a specialist business, or a service division, set up to design and make parts to customer's request. The general procedure for handling a customer's request starts with a sketch of the proposed formed part. After the sketch has been approved by the customer a plaster model of the part is made and submitted for approval. From the approved part a production model is made incorporating design changes and final dimensional tolerances. The production mold is usually made from either aluminum epoxy resin, cast aluminum, or bronze. Generally, cast aluminum molds are not used if volume of parts to be run is not substantial.

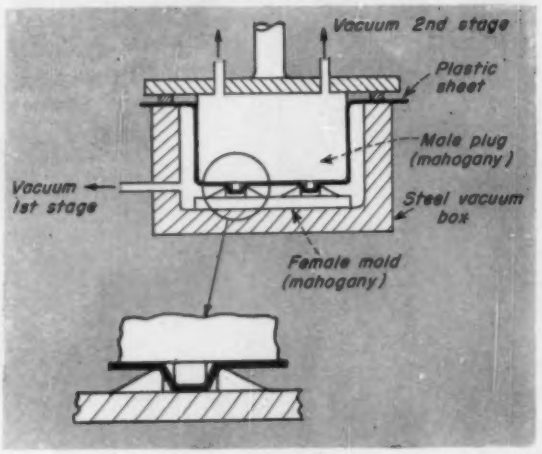
Here are a few general rules which will help serve to indicate when to form or fabricate:

1. Cases where low price and volume make the costs of molding dies economically unfeasible, or when a new product must await acceptance before actual production requirements are known.

2. When, because of piece-part costs and the large area asked for in a thin wall design, the part cannot be molded.

3. Where impact strength of the thin-wall section





Courtesy of Sperle Plastics, Inc

Vacuum snap-back method . . . and a partial female mold form this storage-battery carrier over a male plug. Female mold helps to form two runners on bottom of carrier. Vacuum is drawn on heated sheet as male plug descends into mold. At bottom of draw, vacuum is shut off from box, and transferred to holes in male plug drawing the plastic sheet to contour of plug. Carrier made from ¼ in. thick styrene copolymer is 8x8x16 in., and holds 70 lb of batteries for supplying electrical power to operate a portable polio iron-lung. Finished carrier is approximately more than half the weight of an equivalent metal case and in addition is non-corrosive and acid resistant

is a deciding factor. Most of the thermoplastic sheet materials have excellent impact strength, even on very thin gages. By sheet forming it is a simple matter to rib and cross rib a large area to add rigidity and strength. Every formed rib, bead, turned-over rim, or change of shape adds rigidity to any gage thermoplastic sheet.

4. When, because of probable design changes or alterations, costs of making a mold change, or doing repair work is prohibitive.

5. In cases where short production runs are required. Here a formed part can be set up and production started in less than an hour, while a large molded part might require a full day to set up and cycle out properly.

6. If the beauty of a decorative finish, and in some cases a softer finish, is called for.

7. If certain properties of chemical resistance and strength are demanded.

8. If the mechanical assembly calls for riveting, sewing, or cementing.

9. Where a minimum of strain is required in the part. The sheet-formed part usually (though not always) is more free from strains than an injection-molded part.

10. In cases where the area of a large, flat piece is larger than can be produced on existing injection-molding equipment.

ADVANTAGES OF SHEET FORMING

The sheet-forming field in plastics is here to stay and will grow in importance. Its rapid expansion is attributed to the introduction of heavier-gage materials produced by extrusion, resulting in lower costs. It is also safe to predict that there will be a constantly growing number of applications in entirely new fields.

Yet at the same time the compression and injection molding fields cannot help but be benefited through any growth which takes place in the future in the forming branch of plastics. Advantages of compression and injection molding of plastics were discussed in American Machinist Special Reports No. 421 and 423. To set up a sheet-forming department a model-making shop is essential either within the plant or close at hand. Because sheet forming affords the opportunity for rapid and low-cost tooling, actual production can be achieved in a matter of two, three, or four days against the many months of tooling required for molding the same part.

In sheet forming part sizes and wall thickness of the plastic sheet are not limiting factors as they are in molding practice. Extremely large parts can be sheet formed on relatively light-weight and low-cost equipment. However, it must be realized that in sheet forming the finished part must be trimmed from the sheet.

A definite advantage of sheet forming is its ability to utilize a variety of mold-making materials for turning out sample parts—many times these same molds are used for actual production runs. A rapidly produced mold of plaster or wood can be used to form parts for a given length of time without risk of wear or breakage, prior to making a finished cast-aluminum or cast-iron mold. Plastic molds offer advantages in their ability to be repaired or refaced with minimum interruption of production.

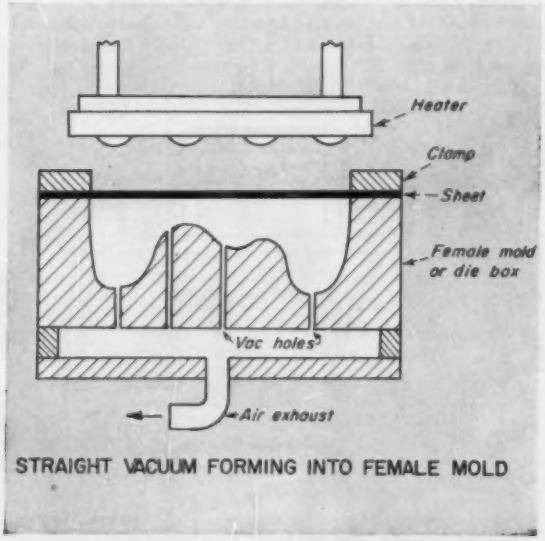
METHODS OF THERMOFORMING PLASTIC SHEET

VACUUM FORMING

Vacuum forming is the simplest and easiest of the several methods of forming thermoplastic materials. Either male or female molds may be used, depending upon the engineering design of the part to be formed, and the time and cost factors.

Courtesy of Basson Industries Corp

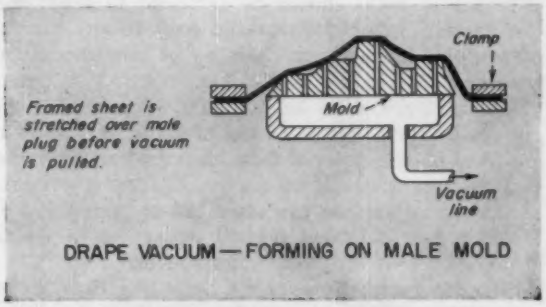
Carrying case and liner . . . for a cold-welding tool, are formed simultaneously from a combination plug and ring mold. Completed case is 75% lighter and less costly than an equivalent metal case. It will also withstand greater abuse, resist corrosion and acids, and because in sheet forming profile of part can be exactly duplicated, welding tool is positively nested. In short, the plastic-sheet forming process can duplicate intricate shapes that would be impossible to achieve by metal-forming



STRAIGHT VACUUM FORMING INTO FEMALE MOLD

Courtesy of Basson Industries Corp

Most costly item . . . in the sheet-forming process is the plastic sheet material. Design and mold costs are the least costly items. Match-plate mold above was essentially made from wood and bakelite with aluminum and brass utilized at the greatest points of wear



DRAPE VACUUM—FORMING ON MALE MOLD

It is generally considered that parts formed by the vacuum method over male molds are better, or stronger parts than those formed in female molds. In multiple unit male molds, a grid frame is often used to assist the material-drape for proper forming. Draping of the heated material over the male mold allows for a heavier wall section at the greatest degree of draw, or the highest area formed.

DRAPE FORMING

Essentially, all thermoforming with male molds is drape forming. The heated sheet must be completely draped over the male mold before pressure or vacuum is applied. With the male mold, maximum stretching caused by the sudden action of the vacuum would take place around the rim section of the part, which can usually be reinforced by a bead-like rim or a crimping operation, or by some other mechanical method when the part may be subsequently joined or assembled to another part.

In cases where the bottom section draws very thin it is often necessary to stiffen this area by afterwards inserting a shaped hardwood base, a hard wire, or a metal band, usually on the inside. Maximum edge strength is obtained with a female mold, while maximum center strength is obtained with a male mold.

Vacuum molds should be well built, as vacuum itself is very strong. It will sometimes crack some cast molds and cheaper wood molds. It can spring metal forms, and it will lose its efficient pull if the seal between the material and the mold is not good. It is

Thermoforming plastic sheet . . .

therefore necessary to have an air-tight seal, and this is accomplished by using pressure gaskets, or the clamping action of the press. Materials will vacuum form quite easily up to a thickness of 3/16 in. Heavier gages must be carefully heated and formed while the material is still pliable. Thermoplastic sheet materials up to ¼-in. stock will form as readily as ⅛-in. material if it is uniformly heated and pliability maintained throughout continuous movement of material. The material should be held firmly in the frame regardless of thickness.

In vacuum forming, where finer details of design or embossed patterns are required, lines and details on the outside surface of the material cannot be less than the material thickness—unless extra mechanical helpers are used under pressure to form details on the outside surface. An interesting and useful possibility in vacuum molding is that of drawing the plastic material around a reinforcing insert made from a piece of steel, wood, or some other equivalent material. For example, shelves on refrigerator door liners are strengthened by embedding a piece of flat or stamped steel into the bottom of the shelf design as it is being drawn and formed. Naturally, the piece is held in the mold as an insert before the forming is done.

Actual forming is accomplished by drawing air from the mold, thus sucking the material down into or over the mold. Air is exhausted through evacuation holes in the mold. These holes should be placed at the deepest part of the forming and wherever sharp edges, grooves, or characters are desired. Number of holes should be sufficient to expel the air rapidly before the material cools to any extent. Therefore, the vacuum chamber or box should be as small and shallow as possible.

Size of evacuation holes should not exceed 1/16-in. dia or more than thickness of material formed to prevent plastic material from entering vacuum holes and leaving a dimple on surface of formed part. As a matter of fact one can often tell on what kind of mold a part has been formed by noting on which side of the part the "vac" holes appear.

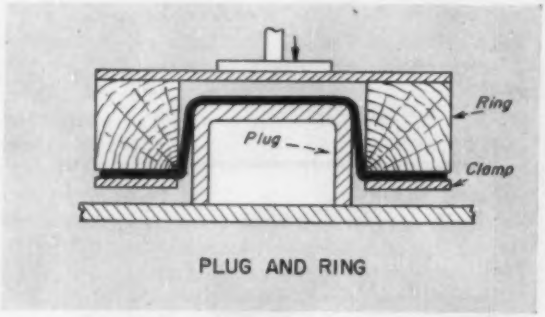
Certain forming manuals have stated "vac" holes should be placed ½ in. apart over the entire mold—such a practice would result in hundreds of holes for a single cavity. In practice, placing holes at 2 to 3-in. intervals is far more reasonable. However, it is important to be sure that enough holes are placed in the important sections where sharp grooves, edges, and characters are required.

DRAW FORMING

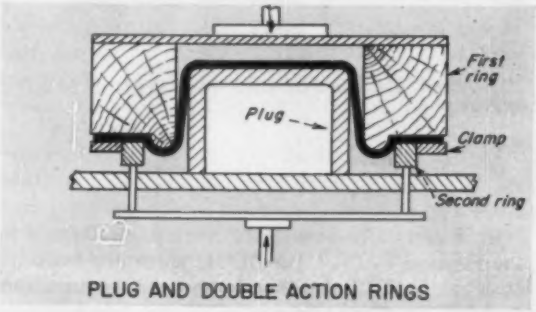
The simplest method of draw forming is accomplished by using a stationary male plug with a draw ring—somewhat similar to drawing or stamping metal without using two heavy steel die sections. In the draw-forming method, the ring draws the wrinkles out of the material and remains in firm contact with the material for the last 20% of the draw. The fit between the ring and the male plug allows only for the gage of the stock.

Courtesy of Product Engineering Laboratories Co. Inc

They said, . . . "Polyvinyl chloride (PVC) could not be deep drawn." Here's proof it can be done if you know how. On a mold costing $135 an instrument enclosure 12x20x14 in. deep is formed from PVC ⅛ in. thick by the plug and ring method without pressure or vacuum assist



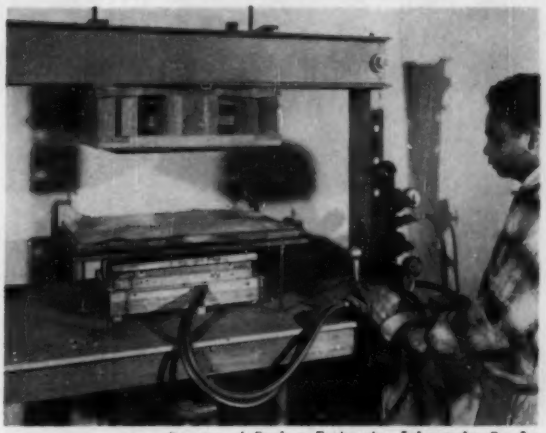
PLUG AND RING



PLUG AND DOUBLE ACTION RINGS

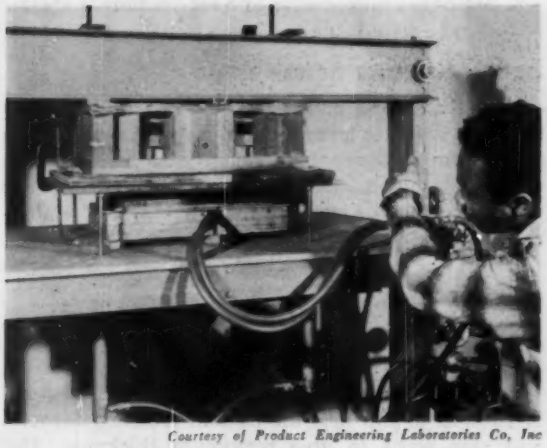
The heated material, if unframed, will often drape down over 1/3 of the mold; it is then pushed down another 1/3; the ring does the final forming on a simple part in the last 20 to 25% of the distance.

Better-forming plastic materials now allow many parts to be formed and drawn in one operation which could never be done in the same ratio in metal. In all kinds of plug forming, mechanical helpers can be used and incorporated into the action of the die to form grooves, recesses, holes or embossed designs (letters, figures, trademarks, etc).



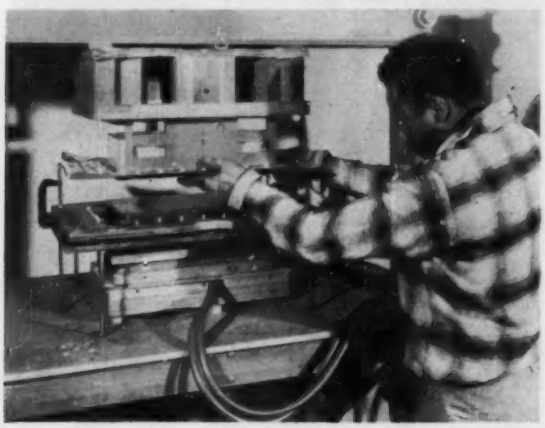
Courtesy of Product Engineering Laboratories Co, Inc

Plug and ring method . . . (no pressure or vacuum assist) of sheet forming starts by draping the heated sheet (approx 325 F) over the mold clamping frame. Note simplicity of shop made press and that in this case pneumatic cylinder is mounted on bottom of press. It is reported that, with the cylinder in this position, drape of the sheet can be better controlled and molds can be mounted much easier. In sheet forming, pneumatic cylinders are preferred because they are faster, easier to control, and have a more uniform stroke. This 8-in. dia air-cylinder uses a line pressure of 200 psi. To right of press are manual controls for air pressure lines. When needed vacuum lines are hooked-up to press from a portable unit

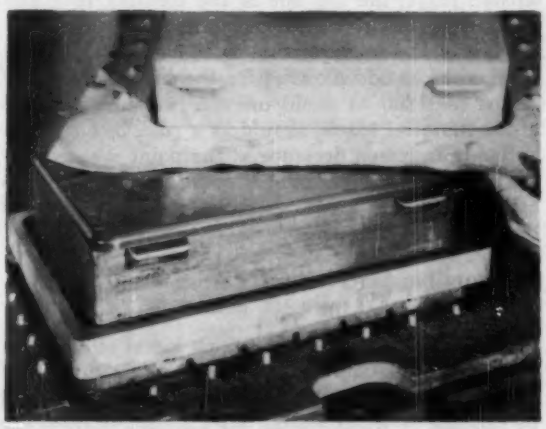


Courtesy of Product Engineering Laboratories Co, Inc

Press platen . . . raises and plastic sheet is clamped to female (ring) mold as male plug continues on upward stroke forming part inside female ring. Air lines shown entering front of mold are used for actuating four side-cores. Mold is made from mahogany. Formica for side cores and for facing mold at the parting line, and aluminum molding around outer edges of the Formica



Slide plates, . . . used in forming of undercuts, are removed with formed part from female mold. Note dowel pins are used on clamping frame to assure non-slippage of plastic sheet



Side cores . . . are shown extended from male plug that has has been raised above clamping frame to facilitate photography. Special tote-tray is formed from 0.125-in. tri-polymer sheet. In the next operation hand routing completes the part by trimming excess material from rolled edge

PLUG AND RING FORMING

By this method of draw forming either the bottom plug or the ring can be made movable or both may move as desired. (Note: the plug or male part of the mold is usually placed on the bottom to take advantage of the combined weight of material and frame to start the forming operation by draping. Information given under the head of draw forming on the whole also applies to this type of forming. Advantages of the plug and ring method, particularly when drawing copolymer sheet 0.040 in. thick or heavier, are:

1. Permits sharp corners at bottom of draw.
2. Produces parts conforming to exact replica of male plug.
3. Shortens mold cycle because plastic sheet when nested in the mold is partially exposed and can be cooled by external devices, without actually cooling the mold.
4. Produces greater depth of draw than by any other method. For example: ratio of diameter to depth = 1:3

   ratio of rectangular openings to depth = 1:2½.
5. Permits more uniform wall thickness.

Thermoforming plastic sheet . . .

6. Molds are inexpensive and set-up time is shorter (average setup time is 15 min).

PLUG AND DOUBLE ACTION RINGS

Use of a second or bottom ring in plug and ring forming, provides an additional forming action—not only downward over the plug, but also upward from the bottom of the mold. (For example, this method would have to be used to form a tote box with a rolled rim around the top edge.)

SLIP FORMING IN PLUG AND RING METHODS

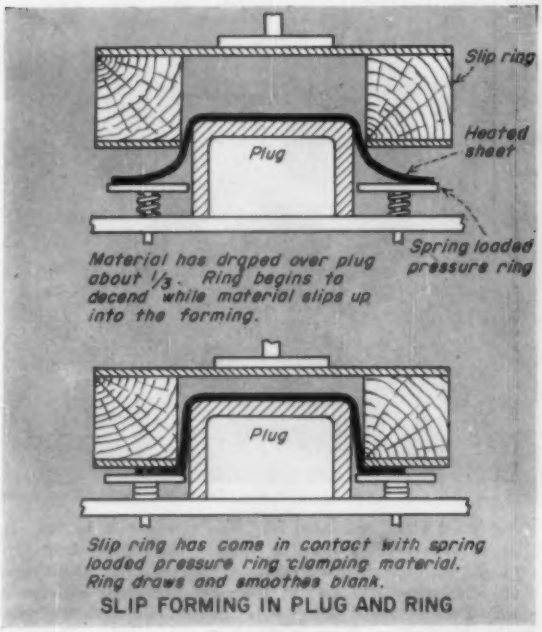
Slip forming is generally required for better or stronger parts where maximum strength is absolutely necessary—a tote box is a good example. The material is not permanently held in a frame, but instead is allowed to slip into the bottom sections, corners, and side walls to give maximum thickness. The blank is cut 10% more in length and width than the total dimensions of the part. After the blank is heated it is allowed to drape over the male plug. As the ring starts to pull down on the material, the material begins to slip up into the forming. It does not start to draw yet. The first draping action covers about 1/3 of the mold; the slipping action continues for at least another 1/3 of the distance before the ring starts to draw the wrinkles out of the material. At this point the blank begins to contact two spring tension rings; the top one is the forming ring and the lower one is a spring-actuated pressure ring. Obviously the forming ring must be well adjusted around the mold, allowing for the proper thickness of the material to avoid uneven pressure. Corners of the material blank, should as a rule, be cut off at an angle to lessen pressure at the point where slippage is desired. Maximum slipping then takes place at the corners; it is also slipping from the four sides but to a lesser degree.

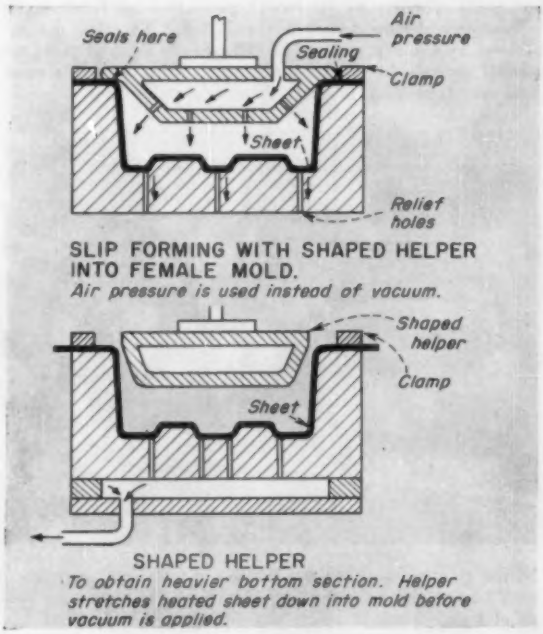
SLIP FORMING INTO A FEMALE MOLD WITH WOODEN PLUNGER AND AIR PRESSURE

To form by this method, a cast metal mold is required to withstand the press action and the added pressure of the forced air. The molding-press should be capable of withstanding high pressures from the plunger, clamping, and air-pressure actions. Material is draped over one gasket and down into the female cavity of the mold. The wooden plunger action is then carried downward either by its own weight or with the help of the press. Plunger almost forms the entire part, and compressed air is then introduced between the plunger and the material; at that stage all of the details of forming take place as the material is forced into the machined cavity details. Entrapped air is allowed to escape through vent holes in the machined bottom mold.

PRESSURE FORMING FROM MATCH PLATE MOLDS

Here a metal match plate mold is required to do the work that would normally be done by forming rings in other kinds of molds. This method of sheet forming is the nearest thing to metal punch press forming or injection molding. It can produce parts with raised or embossed elements of design on one side of the sheet without corresponding depressions on the opposite side; so that parts formed by this method can be similar to injection molded parts in this respect. You have both a female and a corresponding male mold-section. After the heated material is placed between mold sections and mold is closed, forming of the part takes place, allowing clearance for material thickness between mold parts. Perhaps the best feature of this kind of mold is that heat can be rapidly dissipated in the thicker


Slip ring
Heated sheet
Plug
Spring loaded pressure ring
Material has draped over plug about 1/3. Ring begins to decend while material slips up into the forming.
Plug
Slip ring has come in contact with spring loaded pressure ring clamping material. Ring draws and smoothes blank.
SLIP FORMING IN PLUG AND RING



SLIP FORMING WITH SHAPED HELPER INTO FEMALE MOLD.
Air pressure is used instead of vacuum.

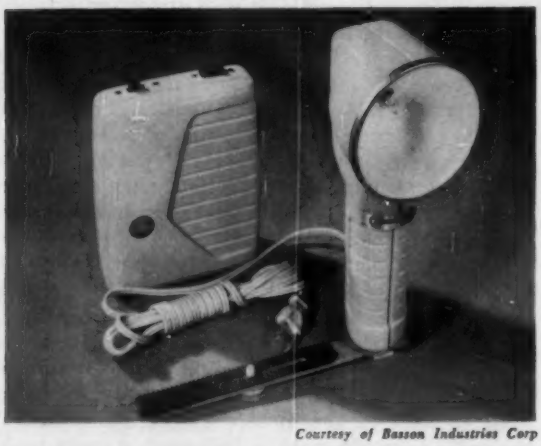
SHAPED HELPER
To obtain heavier bottom section. Helper stretches heated sheet down into mold before vacuum is applied.

Courtesy of Basson Industries Corp

Electronic flash gun enclosure . . . is formed from 0.060 in. thick copolymer by pressure forming into female mold, and using a male plug assist in critical areas to prevent material from thinning out to any great extent. Material thickness did not exceed 50% at base of deepest draw. Male plugs is used around circumference of lens holder to give necessary sharpness of detail. Reverse-undercut running around seam of enclosure locks the two halves together and is formed by a plate on top of female mold. Aluminum epoxy resin was used to form female cavity and bakelite to form male plug

Courtesy of Basson Industries Corp

Portable power pack . . . is formed in the same manner as the flash gun enclosure. Note on open case, left foreground, reverse-undercut on ends of case used for locking the two halves together. Styrene liner, right foreground, is assembled into case-base by snapping it beneath undercut shown on top of base. When two halves of case are snapped together, liner compactly nests four flashlight batteries, a vibrator, and a transformer without any looseness in the entire assembly. Power pack is used to convert 6 V dc to 110 V ac



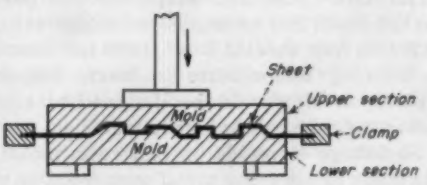
Courtesy of Basson Industries Corp

Completed assembly . . . of the 110 ac-dc flash gun is an excellent example of how sheet forming can turn out compact precision enclosures that are designed and built to meet customer requirements for a specific assembly. The flash gun enclosure was designed by the sheet-former to encompass the customer's capacitor, neon-readylite, and a discharge circuit. This procedure is much easier and less costly to follow than the typical procedure of trying to obtain a stock enclosure to fit a given assembly

sections through direct contact with the two metal surfaces. This is especially true if the sections are water cooled.

COMBINATION PLUG AND RING AND VACUUM FORMING

The most difficult forming jobs can be best accomplished by this combination forming method. This method has other advantages that permit double action of the forming press, moving from both directions, as well as permitting the aid of mechanical helpers to form or post-form the material. It also provides for incorporating the advantages of the vacuum method, where only "vac" holes are needed to form a certain section. As will be gathered from the name, this method is merely a combination of all of the kinds of forming done on molds that can be built up of wooden forms, aluminum or Masonite rings, and any desired kind of helper.



MATCHED PLATE MOLDING

SNAP-BACK FORMING

In snap-back forming the plastic sheet is clamped on top of vacuum box and heated. When the sheet has reached the correct temperature, vacuum is applied to box and sheet is pulled down to a predetermined depth. The male plug is then lowered into the cavity and also clamps air-tight on top of vacuum box. Vacuum is shut off from the box and transferred to the male plug. Vacuum pulling through the male plug snaps and forms the sheet material against contours on the plug. This method insures more uniform wall thickness on deep-draw applications.

METHODS USED IN OBTAINING UNDERCUTS ON FORMED PARTS

Modern vacuum-forming methods permit parts to be produced from thermoplastic sheet that could not

be produced by injection or compression molding without expensive retractible cores because such parts could not otherwise be removed from the mold. Sheet forming is comparable to using loose sand cores in match-plate metal molding. In forming a very deep undercut on one or more sides of the formed part, it is advisable to use movable side cores actuated by hand or air cylinders. When forming smaller undercuts, like beads or snap rings, the vacuum will do the forming. Upon release of vacuum the part can be flexed off the mold while it is still warm and pliable (about 2/3rds cooled) without fracturing the material. This operation is simple if one side of the part can be freed from the mold and slid from the undercut. (For example, pockets or trays on most refrigerator door liners are formed by this method). Loose, removable plugs in sections are sometimes used. It is also possible to form completely around a piece of loose wood or other material and leave it in the part.

POST-FORMING ON PARTS

Often the design of the part calls for undercuts or formed over sections that have to be post formed or placed in the part after the first forming. Post-forming is accomplished by using a fixture, spot-heating the formed part, and simultaneously applying pressure to reform the sections required. It is also possible to crimp a thin-gage material back on itself around an entire edge as on a window frame.

MOLD CONSIDERATIONS THAT INFLUENCE DESIGN OF SHEET-FORMED PARTS

1. **Shrinkage.** Practically all thermoplastic sheet has a substantial shrinkage factor dependent on material, time cycle, and temperature of part as it comes off mold. For example, shrinkage of rubber-modified styrene sheet is 0.048-0.096 ipf when cooled from forming temperature to room temperature. Therefore, molds should be designed to allow for shrinkage of the specific plastic material.

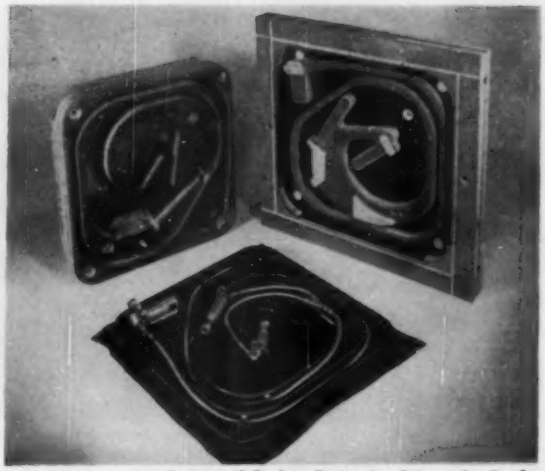
2. **Shrinkage in molds.** In cast-resin molds, or in molds made by spraying metal over wood or plaster, no allowance need be made for shrinkage. When casting a mold in aluminum, however, allowance for shrinkage should be 0.125 ipf.

3. **Heated Molds.** In some cases a mold should be heated to facilitate forming. When such heating is indicated, the mold should be made of a good conductor like aluminum.

4. **Thin mold sections.** Cast-resin molds give good results, provided sections in the mold can be kept fairly substantial. Where sharp folds and similar design details call for thin sections in the mold, molds of aluminum, sprayed metal, or machined steel are recommended.

5. **Mold Finishing.** Cast-resin molds require relatively little finishing to produce smooth, finished parts. Cast aluminum requires more finishing.

6. **Mold Detail.** In forming parts with a single mold, the finest detail is, of course, reproduced on the side which comes in contact with the mold. Therefore, the location of fine detail often determines whether a male or female mold is used. If a high-gloss material is formed with the glossy side in contact with the mold, it is of utmost importance that the mold surface be highly finished.



Courtesy of Product Engineering Laboratories Co, Inc

Materials handling kit . . . is used for shipping a very critical aircraft-control cable. A match plate mold, background, was used to form the untrimmed tray, foreground, from PVC sheet material. At the present time, the largest volume of sheet formed parts, used in Metalworking, is in materials handling applications

7. **Multi-Cavity Molds.** Where several parts are being formed at one time, female molds are usually preferred. Female molds will usually permit more parts to be formed per square foot of sheet, and, at the same time, there is practically no danger of webbing. If a male mold is used for producing more than one part at a time, it is often necessary to use special measures to prevent webbing.

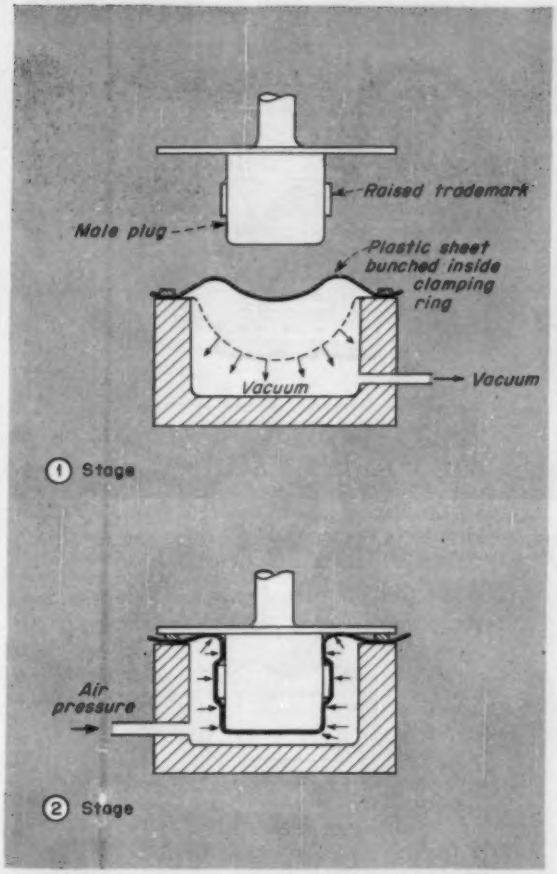
8. **Close Dimensions.** Obviously, the closest dimensions that can be held will be established on the side of the sheet that comes in contact with the mold. Variations in sheet thickness occurring from the draw will cause greater variation in dimensions on the opposite side. Therefore, if the closest dimensions must be held on the outside height and width of the part, a female mold is indicated. A male mold would be preferable if the closer dimensions were on the inside of the part.

9. **Uniform Thicknesses.** Generally speaking, if the part is conical or cup-shaped, more uniform thicknesses can be obtained by the use of a male mold. When a female mold is indicated for other reasons, it is usually possible to obtain good uniformity of wall thicknesses by the use of carefully designed mechanical helpers in the molding process.

POINTERS FOR DESIGNING SHEET FORMED PARTS

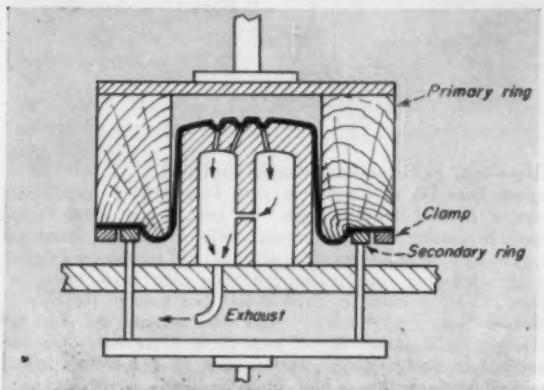
1. **Radii.** Allow liberal radii at bottom of draws. The minimum should be about ⅛ in.

2. **Draft.** If a female mold is to be used, ½° of draft is usually satisfactory because the material will shrink away from the mold. Male molds however, require that drafts be from 1° to 2°, because the material tends to cling to the male plug. In the



Courtsey of Speck Plastics, Inc

Reverse-snap-back forming . . . uses vacuum to stretch heated sheet to a depth of approx 2/3 total draw. *1.* Large opening inside mold frame provides more material for deep drawing without excessive thinning of sheet thickness. 2. Male plug descends and stretches sheet to bottom of draw at which point vacuum is shut off. Air pressure enters the box forcing the plastic sheet to wrap itself around male plug and raised trademark-bosses. After sheet has sufficiently cooled, vacuum is again exerted on formed plastic sheet to facilitate removal of male plug from formed part. Copolymer styrene 0.156 in. thick is used to form this cooler enclosure 11½ in. deep with an opening of 9½ x 16½ in.



COMBINATION VACUUM FORMING AND PLUG AND DOUBLE ACTION RINGS. VACUUM USED TO OBTAIN DETAIL.

case of a relatively rough-surfaced male plug, greater drafts may be required.

3. **Depth of Draw.** No general rule can be made for depth of draw. It should be helpful, however, to note that in a female mold, the greatest thinning occurs in the lower corners at bottom of draw. In a male mold, the greatest thinning normally occurs in the corners at base of plug. Mechanical helpers and snap-back techniques are used to correct these conditions when excessive.

4. **Undercuts.** In many cases, undercuts can be added to the part by the use of a split movable insert, or by a hinged insert. More complex undercut designs usually require an insert that is permanently locked into the part in forming.

5. **Inserts.** Inserts may be locked into the part in the forming process to provide a complex shape, and/or extra strength. In planning a metal insert, bear in mind that the coefficient of expansion of plastic is several times greater than that of metal. Therefore, in cooling or afterwards, a rigidly supported insert may cause flashing of the sheet. It is important that the design make due allowances for this important difference. In some cases a non-rigid metal insert may be used. In others, the design may permit a certain amount of movement of the insert. If the design of the part requires that the sheet fit tightly around a rigid insert, an insert of wood or Masonite is recommended, because in these materials the coefficient of expansion is much closer to that of the plastic sheet.

6. **Rigidity.** Where added rigidity is required in the part, it is usually a simple matter to add beads, ribbing, and rolled edges.

7. **Determining Sheet Thickness.** A simple formula makes it possible to determine approximately the thickness of the sheet required to form a given part. Multiply the average thickness desired in the part by the total of all areas in the formed part; divide the result by the area of the flat sheet within the clamp on the sheet-forming machine.

$$\frac{t_a \times A_p}{A_s} = \text{Sheet thickness (min.)}$$

t_a = Average thickness of part
A_p = total area of formed part
A_s = area of sheet within clamp ring

This will indicate the absolute minimum thickness required in the flat sheet. In most cases this should be increased slightly, particularly in cases of long draws and complex parts.

8. **Bosses and Assemblies.** When mounting bosses are required, they should in nearly all cases be cemented into place after the part is formed. Cements now available for leading thermoplastic sheets produce a bond of great strength. Modern cementing processes greatly increase the designer's latitude in complexity of design.

9. **Illumination.** When a formed part is illuminated from the back, there is definite danger that thinning at corners will cause apparent differences in color. It is therefore important that parts to be illuminated in this manner be kept simple in design,

Thermoforming plastic sheet . . .

with smooth, flowing lines, so that uniform thickness can be maintained in forming.

WHEN TO USE A MALE MOLD

1. To get sharpness of design on inside of part.
2. When part is to snap back on a male plug, after vacuum is applied and released. This method stretches the material more evenly and obtains a firmer part with greater equalization of wall thickness.
3. In order to obtain a heavier section at the deep part of the mold by the drape method. It is important, however that drape forming is done before vacuum is applied. This is a very important point.
4. Generally, a male mold is cheaper to build because the material is cut away, thereby making mold fabrication a lot easier. Quite often the form can be made in sections and assembled afterward—a practice that makes for a better finish on the mold and for easier mold repairing. Therefore, the cost factor in making the mold often decides the method.
5. When time is the critical factor.

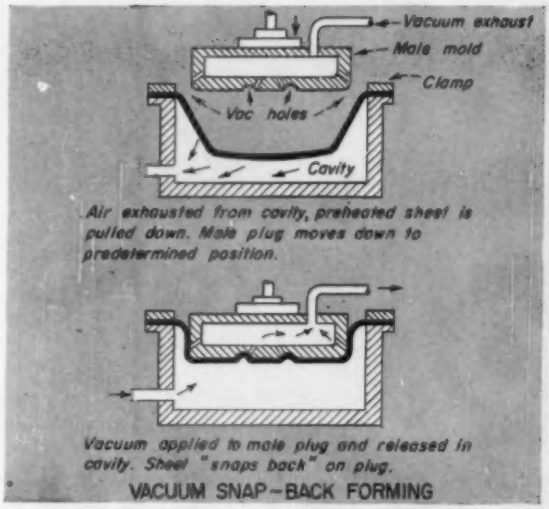
WHEN TO USE A FEMALE MOLD

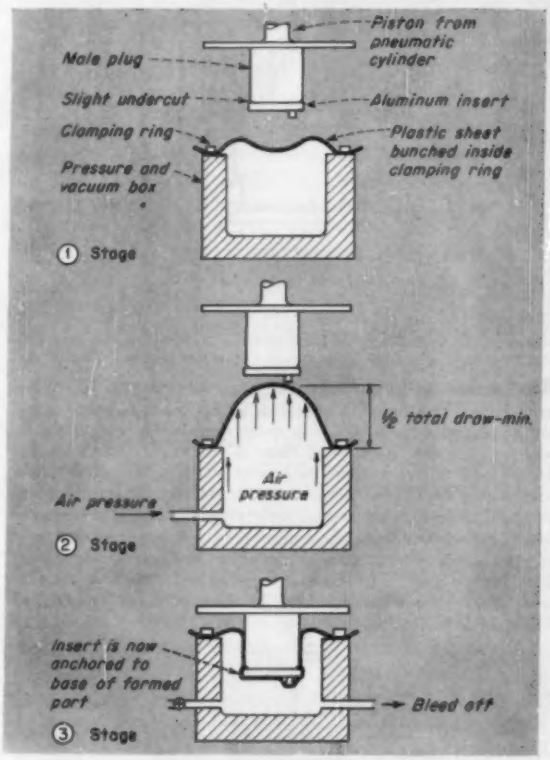
1. If the sharpness of design or embossed area is desired on the outside of the part.
2. If close tolerances and a high finish are to be obtained on the outer surfaces of the part, a polished metal mold should be used.
3. Often, a female mold must be used when a heavy wall section is required at the start of the draw. To meet this requirement good results can be obtained by stretching the material down as far as possible into the mold with a plug assist before applying the vacuum. By avoiding sudden vacuum action, a part with more even thickness in all areas is obtained. In the case of a hemisphere, the paper-thin section of the axis point would be avoided. Using this method, proper forming techniques can be worked out to give maximum uniformity of wall thickness.
4. When the cost factor in making the mold is favorable in relation to the design of the part required. Or when an exact model is available and a cast mold is to be made. Or when a multiple cavity mold is to be made from a master shape or hub. Or when the forming of the part will be better if the material is unframed and allowed to lay into the mold before forming.

KINDS OF MOLDS USED IN THERMOFORMING

One of the most important advantages of either vacuum or draw forming is the use of low pressures, and low-cost tools that can be made in a matter of days rather than the expensive molds machined from tool steel. In vacuum forming, the pressure can range from 10 to 14 psi, the maximum required even for ¼-in. stock. The grade of mold will be based on the required kind of forming, method of forming, quantity of parts to be produced, and exactness of duplication desired.

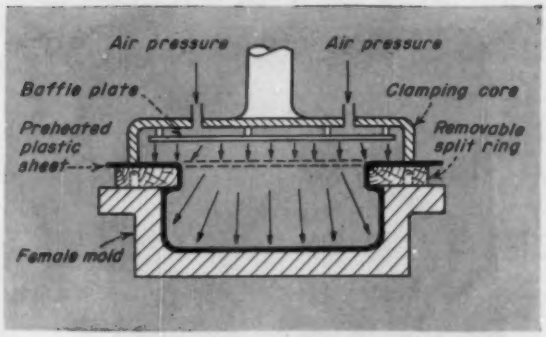
A female mold is best for multiple-cavity vacuum forming because a female mold requires less area


Vacuum exhaust
Male mold
Clamp
Vac holes
Cavity
Air exhausted from cavity, preheated sheet is pulled down. Male plug moves down to predetermined position.
Vacuum applied to male plug and released in cavity. Sheet "snaps back" on plug.
VACUUM SNAP-BACK FORMING



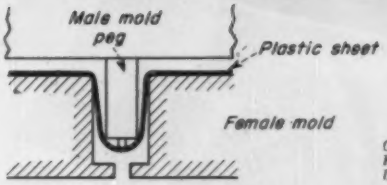
Courtesy of Speck Plastics, Inc

Blow-up, reverse-snap-back method . . . produces a freezer liner 7½ x 14 x 9½ in. deep from 0.125 in. copolymer styrene. *1.* After the plastic sheet has been heated to 325 F the operator bunches the sheet across width of clamping frame to acquire as much extra material as is possible for the deep draw. A threaded stud running through male plug holds insert in place. *2.* Air pressure is directed into box causing the plastic sheet to form a large bubble, thus pre-stretching the sheet to a height no less than one-half total draw. *3.* As male plug descends into bubble, air pressure is shut off and bleeder valve opened. Air in the box is bled off as the plastic sheets continues to form around male plug. When plug is about 1 inch from bottom of draw, air in tank is completely exhausted thereby removing all wrinkles from formed plastic sheet.



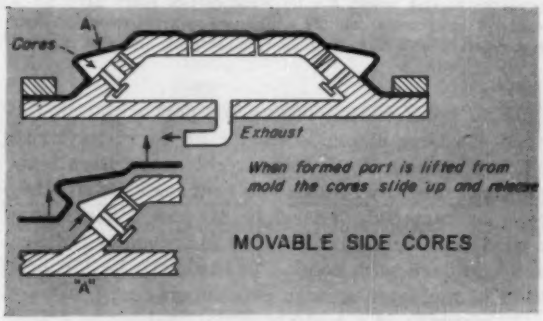
Courtesy of Speck Plastics, Inc

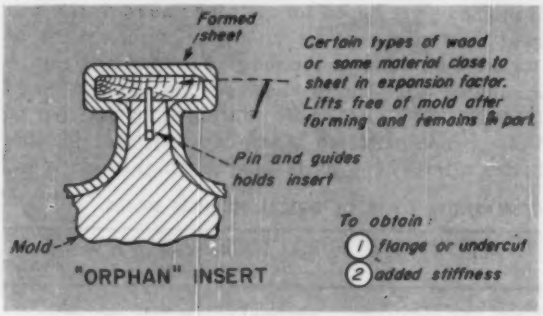
Pressure forming plastic sheet . . . inside a female mold using a removable split core for forming a deep undercut. Preheated plastic sheet is placed on face of core and secured by clamping ring when press ram descends. Air pressure introduced into moldbox forces the pliable sheet to conform to shape of female mold. After a sufficient cooling period, ram is retracted, and formed part along with split core is removed from mold. Press operator removes core from undercut and relocates it on dowel pins atop female mold. Clamping pressure is 10T on the ram, air pressure is 125 psi, and material is copolymer styrene 0.125 in. thick

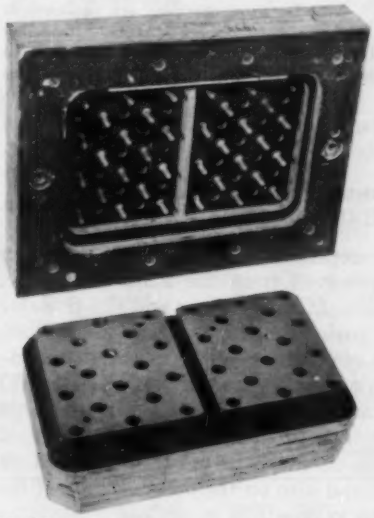


Courtesy of Product Engineering Laboratories Co, Inc

Upset-mold . . . designed for plug-and-ring method formed the unusually deep pegs on this materials handling tray. Raised ⅛-in.-dia bosses on ends of pegs additionally served to nest part. Sketch shows how pegs 1-in. high are formed




Formed sheet
Certain types of wood or some material close to sheet in expansion factor. Lifts free of mold after forming and remains in part
Pin and guides holds insert
Mold
To obtain:
1 flange or undercut
2 added stiffness
"ORPHAN" INSERT



Courtesy of Product Engineering Laboratories Co, Inc

Mold tolerances . . . when justified are held to $^{+0.005}_{-0.000}$ in. Some formers prefer to use maple wood for mold construction because it is relatively soft, easy to cut, has low moisture content, and good density that helps to provide excellent surface finish and definition. Mold shrinkage is held to ⅛ ipf, and sometimes as an extra precaution the wood is preshrunk. Holes, shown in female mold above, are for air relief

between cavities—therefore uses less material and makes trimming easier. Vacuum-forming molds are generally non-movable and thus may be made of lighter stock. However, whether the mold is to be made as a male or female depends on the kind of forming, shape of part, cost, and time that can be applied to the job. It is often easier to build up a male mold by finishing and assembling various units in setups in preference to "hogging-out" a female cavity, then hand filing and polishing to produce a good surface finish.

Materials that may be chosen for any one mold depend on the application, and production requirements. It is entirely feasible that good cast plastic resin molds will eventually prove their quality and be among the best as better workmanship is developed along with the improved cooling techniques and methods of handling. One of the latest methods of

Courtesy of Product Engineering Laboratories Co, Inc

Courtesy of Speck Plastics, Inc

Engineer kits, . . . similar to erector sets, are packaged in cases designed and made by plastic sheet formers. Kit on left has three trays and holds precision parts that will enable an engineer to assemble gear trains and actuator devices for his own specific end result. Kit on right carries spare parts for a precision component, thereby enabling engineers to make their own repairs. Both kits are made by the plug and ring method

mold construction utilizes electroplating to produce high-grade molds at low cost.

FACTORS TO CONSIDER WHEN MAKING A MOLD OF A CERTAIN MATERIAL

1. Production depends on how fast the part can be cooled and removed from the mold. Therefore, all metal molds should be cored out and either water or air cooled to dissipate heat as rapidly as possible. (Cooling time may run from 15 sec to 5 min depending on the mold, gage, and kind of plastic material.)

2. Perfectly smooth parts require a polished mold of a material that will not nick or lose its good finish. All marks on the mold will be imposed on the formed part and also on the outer surface if the stock is of a thin gage—1/16 in. or less.

3. It is important to dissipate heat from the mold to accomplish the best forming and production rates. For instance, molds used to form rubber modified styrene sheet, operate best at about 140 F and not over 160 F, while the heated sheet will be about 325 F. Taking the above reasoning into consideration, it is easy to realize why plaster molds crack from the heat and pressure. Wood molds will expand from heat, causing the grains to open up and produce rough parts. Cast resins, Masonite, and sprayed metal molds are usually constructed as a solid unit. Therefore, it is considered most important to cool these molds by internal water or cold-air lines and exterior cold air. Internal cooling lines may be cast into the materials before the final casting is completed. External cold air is generally directed onto the formed part, by using copper tubing with multiple air holes circumventing the part while on the mold. Cast-metal molds should be cored for more efficient cooling. Noteworthy in this respect is aluminum. because it will dissipate heat faster than other common materials. Therefore, we can concede that a good cast-aluminum mold that is properly finished and equipped with cooling devices will be the best kind of mold for a large production run.

4. Masonite is a mold material that plays a dual role, because it can either be easy or hard to work. It might be very good for molding one part, but will hold too much heat for another. Therefore, use of Masonite depends on the job. When Masonite can be laminated together to acquire the desired mold thickness and also easily machined, it is hard to beat as good molds go. Masonite molds will perform better after 10,000 parts than when they are new.

COMPARATIVE COSTS OF TYPICAL FORMING MOLDS

Part	Size	Mold Material	Kind of Form	Cost
Round tray	13-in. dia	mahogany	vacuum-snap-back	$120.00
TV mask	21-in. unit	cast aluminum	vacuum	325.00
Freezer liner	30x48 in.	mahogany (4-in. squares)	vacuum	435.00
Tote box	18x14x6 in.	wood and Masonite aluminum	plug & ring	450.00 750.00
Refrigerator liner 10 cu ft		wood aluminum	vacuum	1250.00 2800.00

TYPICAL THERMOPLASTICS USED IN SHEET FORMING PROCESS

MATERIAL	APPLICATION	APPEARANCE	STRENGTH	ADVANTAGES	DISADVANTAGES	COST
Cellulose Acetate	packaging toys, games, displays	good surface finish range of colors also clear, transparent form metallizes beautifully	excellent impact and toughness, good tensile and flexural strength	fair dimensional stability, resistant to weak acids	high coefficient of expansion, limited dimensional stability, relatively high moisture absorption, long-term aging	moderately low—lowest in cost of transparent materials
Acetate Butyrate	displays, airplane interiors skylights lighting fixtures	same as above	greater toughness, resilience, and impact	good stability, low shrinkage, low moisture absorption, good dimensional stability, good weathering characteristics	slight odor not optically clear	lowest with outdoor properties
Ethylcellulose	packaging electrical instruments	same as above	extreme toughness	high stability, maintains characteristics at low temperatures, good electrical properties	amber in clarity	high—but economically feasible
Methyl Methacrylate	windows, cockpit enclosures, transparent auto roofs, skylights, windshields, enclosures, lighting fixtures	extreme clarity (water-clear), outstanding degree of optical clarity	excellent flexural and tensile strength, sufficient flexibility to resist shattering	high heat resistance, rigidity, optically clear, good weathering characteristics	high fabrication cost, low impact strength	high—but economically feasible

MATERIAL	APPLICATION	APPEARANCE	STRENGTH	ADVANTAGES	DISADVANTAGES	COST
Rubber-Modified Styrenes or Alloys	toys, games, packaging enclosures, parts requiring strength and appearance, displays, refrigerator doors	complete range of colors, matte or glossy surface	good impact, good dielectric strength	dimensionally stable, highly resistant to moisture and chemicals, non-toxic, low specific gravity	lack of rigidity, low surface hardness, poor flex fatigue, discolors under ultra-violet, soluble in acetones, ketones toluene, benzene, carbon tetrochloride	lowest of thermoplastic, sheets
Rigid-PVC Type 1 (UPVC) Polyvinyl Chloride	chemical structures	transparent, translucent, opaque, industrial, colors	normal impact	inert to many chemicals, excellent weathering	creeps under load	high
Rigid-PVC Type 2	parts requiring high impact	industrial, colors	high impact, permanent, tensile strength not favorable	lower chemical resistance than Type 1	creeps under load	high
Polyethylene (Standard)	packaging, toys, housings, luggage	wide variety of colors, fiinshes from dull to glossy	low-temperature flexibility and impact resistance	excellent moisture-vapor barrier, good chemical resistance, exceptional electrical properties, low specific gravity	low oxidation resistance, high creep, low heat distortion temperature, poor cementing property	low

Thermoforming plastic sheet . . .

MATERIAL	APPLICATION	APPEARANCE	STRENGTH	ADVANTAGES	DISADVANTAGES	COST
Rigid Vinyl Chloride Acetates	lighting fixtures, items presenting a fire hazard, packaging	complete range of colors, also clear	excellent tensile strength, high modulus of elasticity, good flexural strength	good dimensional stability, low coefficient of thermal expansion self-extinguishing properties	high specific gravity, limited thicknesses	slightly above average
Elastomeric forms of vinyls				used in other forms of fabrication	high flexibility	low
Polystyrene (General Purpose)	lighting	excellent surface finish, clarity, and colorability	low impact, good tensile strength	high dimensional stability, good dielectric properties, odorless and tasteless, excellent moisture resistance	low specific gravity	low
Plasticized Copolymers of Styrene and Butadiene	machine encolsures, tote boxes, luggage, carrying special containers, ducts, panels, interior trim in aircraft	good color range; matte smooth, or grain finish	outstanding impact, good tensile and flexural strength, good low temperature impact	relatively high heat-distortion point (183 F), deep draws, possesses great flexibility when combined with high rubber content	less rigid than other styrenes	slightly above average

FINISHING OF FORMED PARTS CUTTING AND TRIMMING

It is in this particular step of plastic sheet fabrication that there is more room for development and change over to automatic processes than anywhere else in the field. The slow and relatively crude majority of shorter run jobs are trimmed by using a band saw or hand router; then sanding on a belt or spindle type sander. In short, finishing is done in much the same manner it would be done in wood. Quite often the rough edges have to be smoothed with a solvent that will cut the plastic.

Many large-production runs are first formed and then stamped out on a steel die with maximum economy. However, there are cases where this does not apply, because even though the dies are inexpensive, additional parts handling is involved that can affect the economy. Most TV masks are produced in this manner, and often clicker-type dies are used.

Some more experienced firms have started to incorporate into the molds steel-rule dies that trim the part at the end of the forming cycle. Obviously this setup eliminates the secondary trimming operation and considerably speeds production. It has been proven perfectly satisfactory to perform the trimming operation while cooling is nearing its completion.

Steel-rule dies are inexpensive and usually work well when mounted in heavier forming rings of the mold, or when allowed to operate adjacent to the forming ring. A somewhat better grade of cutting die may be required for more difficult jobs.

We sincerely wish to express our appreciation to the following companies for their cooperation in the preparation of this Special Report:

Chicago Molded Products Corp

Basson Industries Corp, Yonkers, NY

Product Engineering Laboratories Co, Inc, Newark, NJ

Speck Plastics, Inc, Port Washington, NY

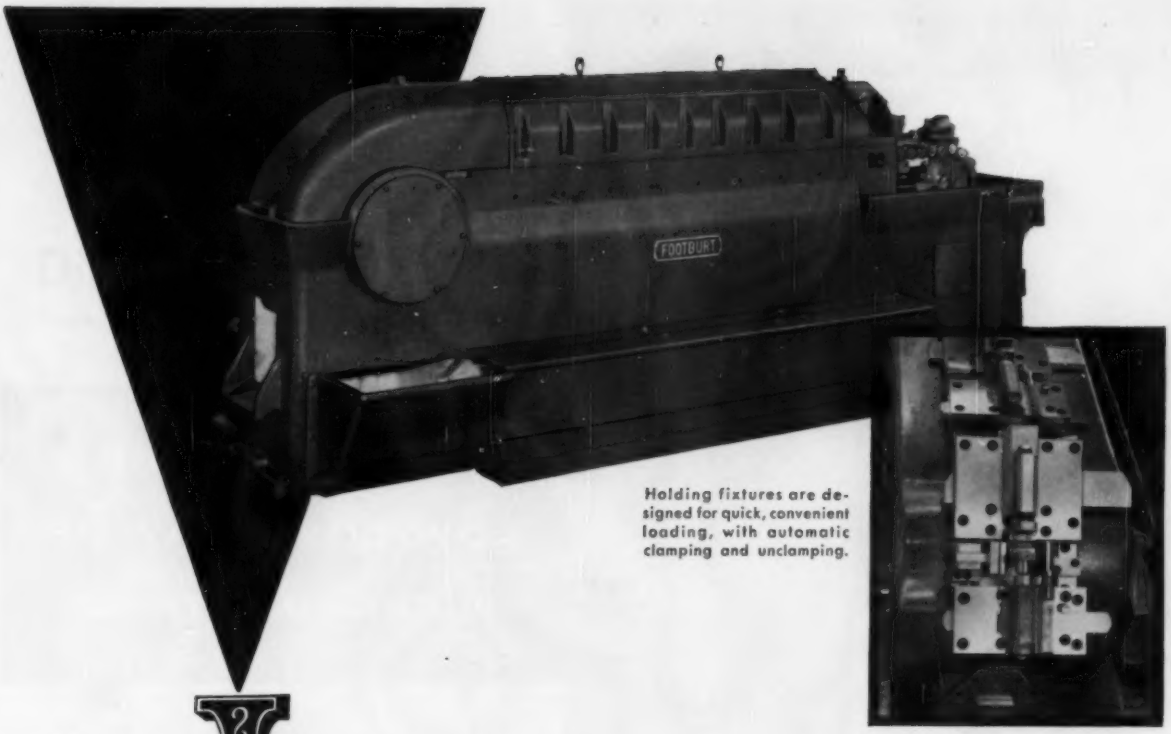
REPRINTS ARE AVAILABLE

of this and all other

American Machinist

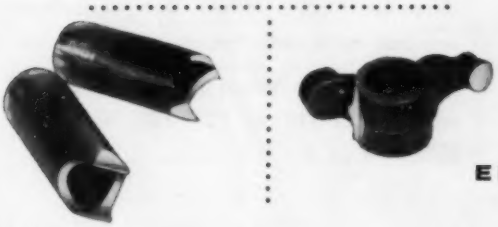
special reports

Send to Reader Service Dept, American Machinist, 330 W 42nd St, New York 36, NY, for list of reprints available and prices. Or enclose, with your request for a specific reprint, 35¢ if it is 16 pages, 30¢ if 12 pages, 25¢ if 8 pages. Prices are reduced for quantities over 100 copies.



Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.

LOWER COST . . . PER PIECE WITH SURFACE BROACHING OF SMALL PARTS



In many plants where large quantities of duplicate metal parts are being machined, substantial savings are being made through the adoption of surface broaching. Production is exceptionally high, close tolerances are maintained, and tool maintenance costs are much lower than with ordinary methods. Foote-Burt engineers, pioneers in this advanced machining method, have had a wide experience in applying surface broaching, in many fields.

THE FOOTE-BURT COMPANY
Cleveland 8, Ohio

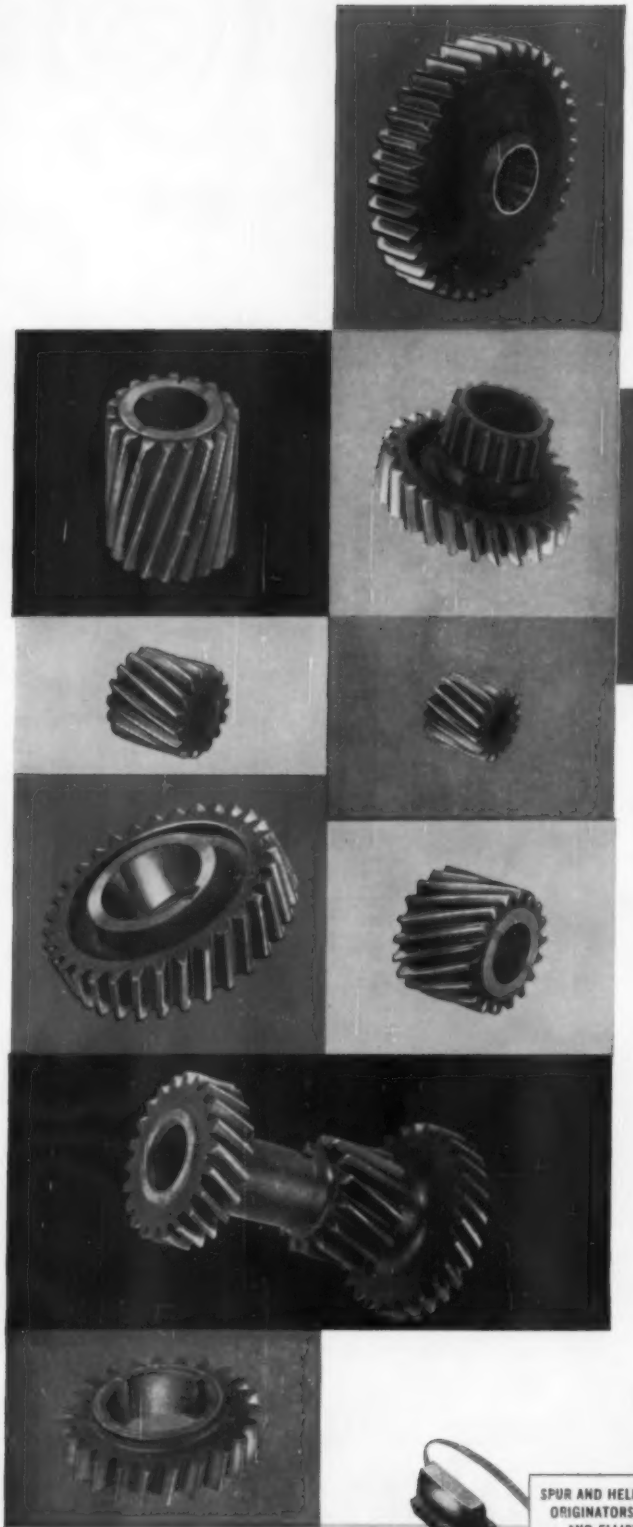
Detroit Office: 24632 Northwestern Highway, Detroit 35, Mich.

ENGINEERED FOR PRODUCTION

Write for Circular No. 503

FOOTBURT

PIONEERS IN SURFACE BROACHING



GEAR TOOTH NICKS and "HICKIES"

HONING IS THE LOW-COST WAY OF SILENCING THEM

You can hone the average automotive transmission gear in from 15 to 60 seconds. This single operation gets rid of all the noisy nicks and hickies that are so troublesome and tedious to deal with in any other way.

But that's not all. Red Ring honing also improves over-all surface finish—down to 2-4 microinches if necessary.

The initial pass under the honing tool is an effective inspection procedure in that it immediately reveals any distortions that may exist in tooth profile, spacing and pitch diameter runout. When such distortions are not excessive, honing corrects them.

If you want to reduce the cost of silencing noisy gears (1" to 12" PD), write for Bulletin H 57-2.

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORM

7810

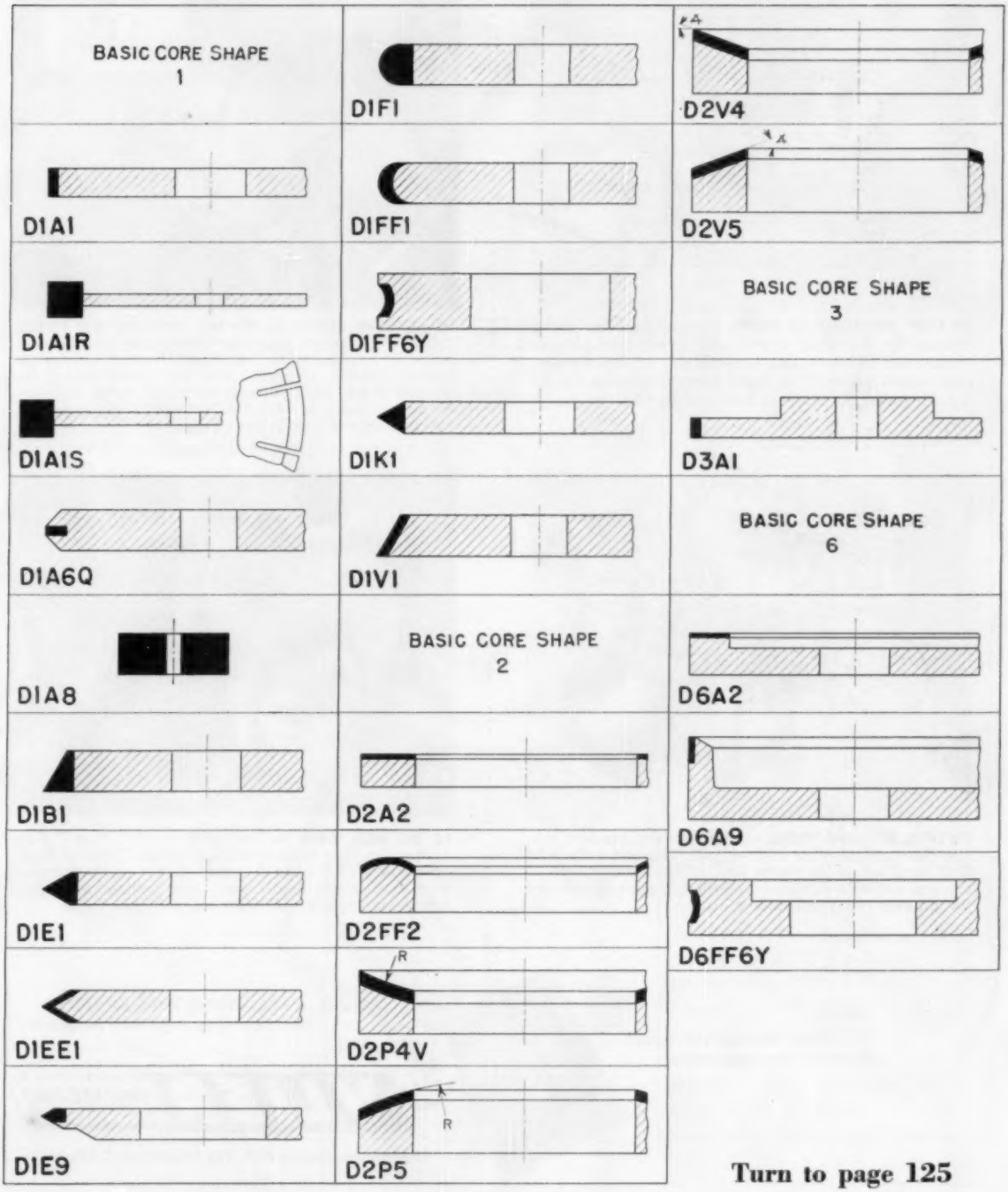
NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

Diamond-Wheel Shapes . . III

Courtesy Grinding Wheel Institute

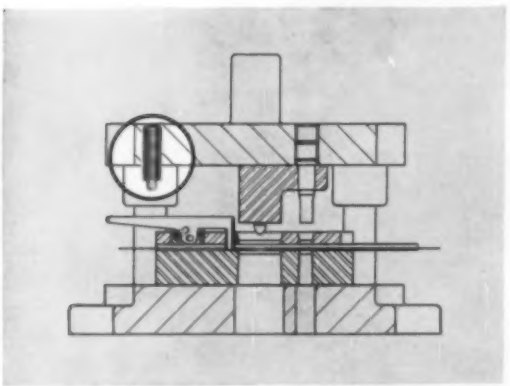


Turn to page 125

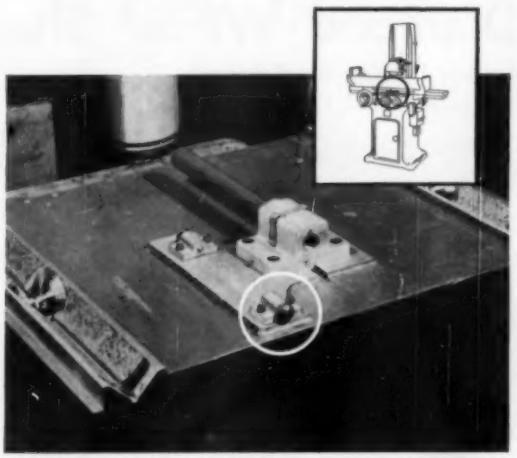
Practical Tooling Tips

Number 2 of a series.

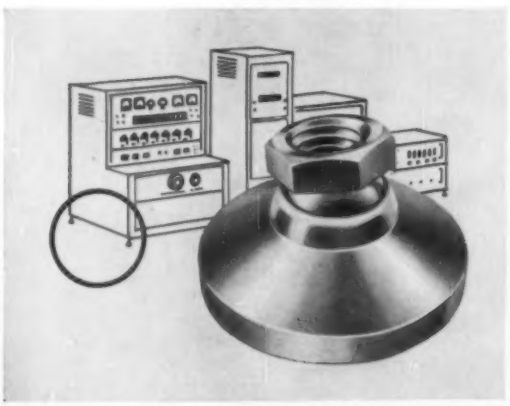
Substituting simple, off-the-shelf Vlier Tooling Accessories for complicated, custom-made devices in both tooling and original equipment applications can result in important savings. Why not put them to work in your plant?



TO STOP SMASHING DIE STOPS, substitute a Vlier Spring Plunger for the usual square-head screw. The plunger actuates the automatic stop perfectly and, unlike the screw, never needs adjusting no matter how many times the die is resharpened. Available in four models: 50 sizes.



TO CUSHION SHOCK as the bed traverses, this surface grinder manufacturer uses two Vlier Spring Stops, reducing wear and tear on the machine. These clever, spring-loaded devices, ordinarily used on fixtures where the absence of side walls prevents the use of spring plungers, are now available in three standard sizes: 3 end pressures. Special sizes made to quantity orders.



TO LEVEL MACHINE TOOLS, electronic racks, benches, etc., use the *standard* Vlier leveling pad. The pad swivels to 7½° each side of the center line; adjusts automatically to uneven surfaces. Unique ball-joint design distributes weight over entire pad surface.

TO GET NEW IDEAS on how to save with Vlier Tooling Accessories, send for new 28-page booklet "Typical Applications of Vlier Tooling Accessories." It suggests dozens of ways to use these time-savers in both tooling and original equipment applications. Write for your copy today.

New catalog now ready! Send for your copy today.

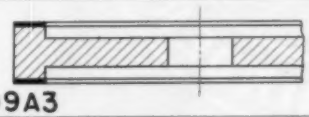
Insist on Vlier Tooling Accessories... there's still no substitute for quality!

VLIER ENGINEERING INCORPORATED

8900 Santa Monica Blvd., Los Angeles 46, California

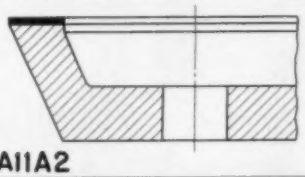
Diamond-Wheel Shapes . . IV

BASIC CORE SHAPE 9

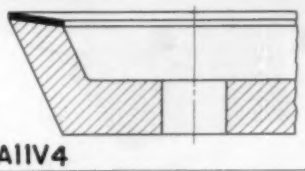


D9A3

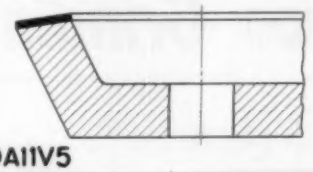
BASIC CORE SHAPE 11



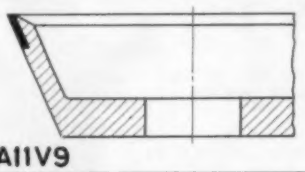
DA11A2



DA11V4

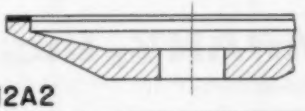


DA11V5

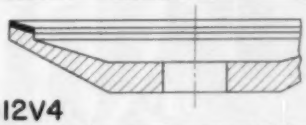


DA11V9

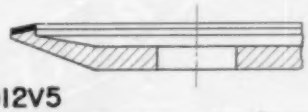
BASIC CORE SHAPE 12



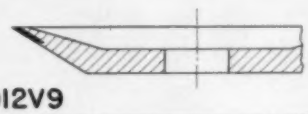
D12A2



D12V4

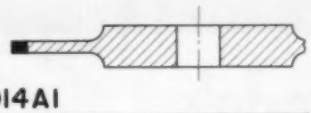


D12V5



D12V9

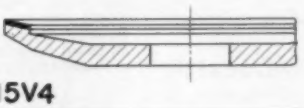
BASIC CORE SHAPE 14



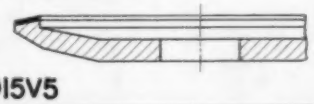
D14A1

BASIC CORE SHAPE 15

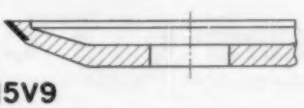
D15A2



D15V4



D15V5



D15V9

DIAMOND WHEEL DESIGNATIONS

New	Old
D1A1	D1T
DIA1R	D1TRS
D1A1S	D1TRSS
D1A60	D1U
D1A8	D1S
D1B1	—
D1E1	D1TE
D1EE1	D1TEE
D1E9	D1TM
D1F1	D1TF
D1FF1	D1TFF
D1FF6Y	D1U6
D1K1	D1TE
D1V1	—
D2A2	D2W
DFF2	DL2WR
D2P4V	DL2WR1
D2P5	DL2WR0
D2V4	DL2WV1
D2V5	DL2WV0
D3A1	
D6A2	D6W
D6A9	D6U
D6FF6Y	D5UG
D9A3	D9W
D11A2	D11W
D11V4	D11WV1
D11V5	D11WV0
D11V9	D11B
D12A2	D12W
D12V4	D12WV1
D12V5	D12WV0
D12V9	—
D14A1	D14U
D15A2	D15W
D15V4	D15WV1
D15V5	D15WV0
D15V9	D15B

Three 6-18 Models . . . *for Toolroom and Production Grinding*

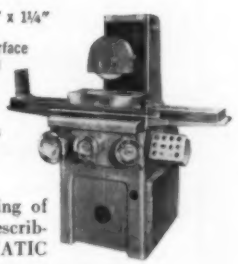
REID . . . the quality name in surface grinders . . . now has three different models in the 6″ — 18″ size. If your production schedule demands maximum automation, there's a REID 618P with power table and power cross feed. A REID 618PT with power table and hand cross feed is also available.

For tool and die makers, the hand operated 618H is ideal for precision grinding. On all models, a Cross Slide Lock is included as standard equipment.

Compare . . . check the extra features on all REID grinders . . . and standardize on quality. For complete details on models shown, write for Bulletin 618.

SPECIFICATIONS

Capacity: 6″ wide, 18″ long, 17¼″ from spindle center to table. Standard wheel 7″ x ½″ x 1¼″ included
Worktable: 51″ x 8″ overall; 6″ x 18″ working surface
Table Speed: Infinitely variable from 12 to 35 FPM
Cross Feed: Infinitely variable from .006″ to .100″
Floor Space: 71″ x 43½″
Weight: 2400 lbs.
Electrical: 3 phase, 60 cycle, 220, 440 or 550 volts
All Models Equipped with Automatic Lubrication as Standard Equipment



For Toolroom and Production Grinding of larger capacity, write for bulletin 824 describing our New All Electric 8-24 REID-O-MATIC Surface Grinder.

REID BROTHERS COMPANY, Inc.

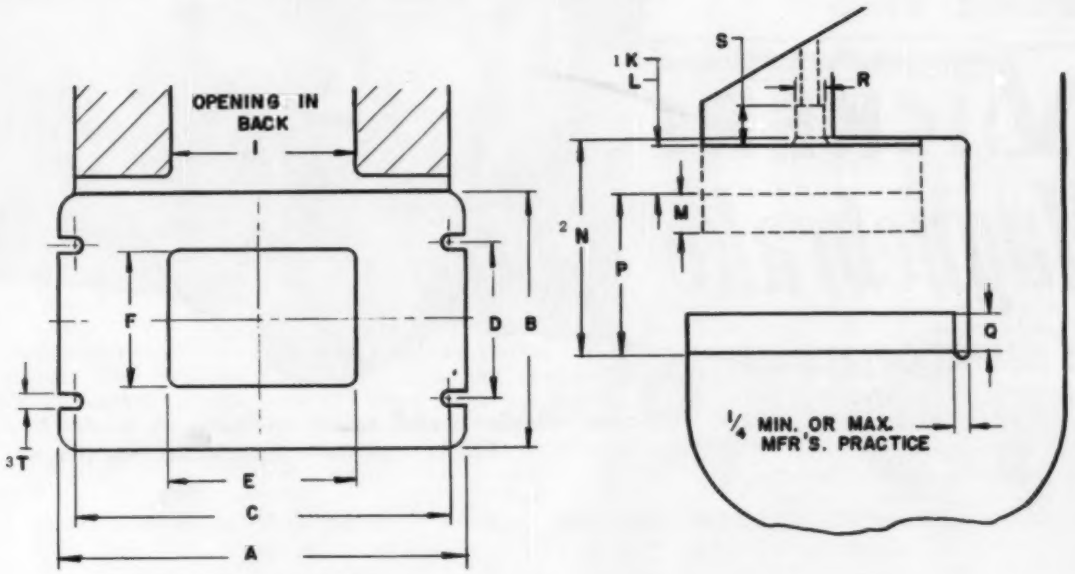
133 Elliott Street, Beverly, Massachusetts

MANUFACTURERS OF PRECISION SURFACE GRINDERS AND PRODUCTION LATHES

JIC Press Room Standards

Open-back stationary presses–single crank

Dimensions of bed, bed opening, stroke, adjustment and bolster thickness, as developed by the Joint Industry Committee



H – BOLSTER BOLT DIAMETER

Tonnage	A	B	C	D	Bed Opening E Min.	Bed Opening F Min.	H	I	Standard Strokes K	Maximum Strokes L	Ram Adjustment M	Bed to Gibs N	Shut Height P	Bolster Thickness Q	Drilled Clearance Hole R	S Min.	KO Bar Travel	T
22	20	12	18	7-1/2	8	5	3/4	9	2-1/2	4	2	11-1/4	8-1/2	2-1/2	1-5/8	2-1/4	1-1/4	
32	24	15	22	9	11	8	3/4	11	3	5	2-1/4	12-3/4	9-1/2	2-1/2	1-5/8	2-1/4	1-1/2	
45	28	18	25-1/2	10-1/2	14	8	1	13	3	6	2-1/2	14-1/4	11	3	2-1/8	3	2	See Note 4
60	32	21	29-1/2	12	16	11	1	15	3-1/2	7	2-3/4	16-3/4	13	3	2-5/8	3	2-1/4	
75	36	24	33	18	18	14	1-1/4	18	4	8	3	19-1/4	15	3-1/2	2-5/8	3	2-1/2	
110	42	27	39	18	21	15	1-1/4	21	5	10	3-1/2	23-1/4	18	4	3-1/8	3	3	
150	50	30	47	18	21	17	1-1/4	24	6	12	4	28-1/4	22	4-1/2	3-1/8	3	4	
200	58	34	55	18	27	21	1-1/4	27	8	12	4-1/2	32-1/4	24	5	3-1/8	3	4	

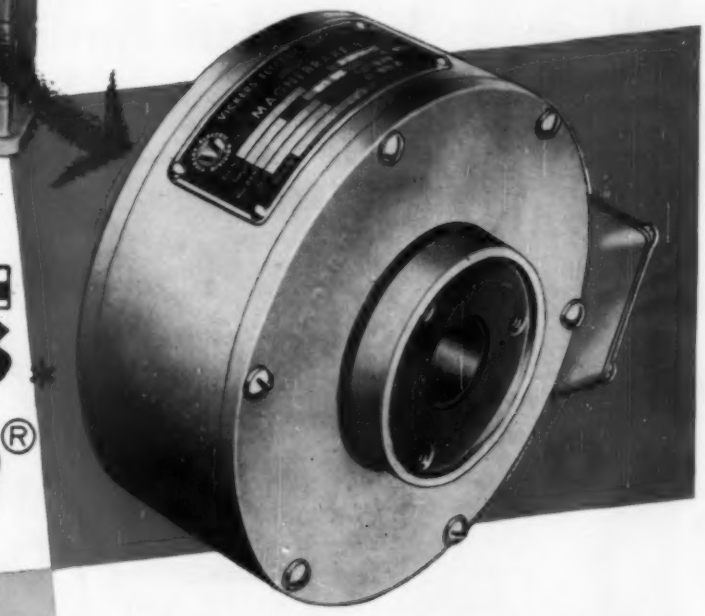
FOOTNOTES:

[1] Any change from standard stroke will increase or decrease the shut height.

[2] N. Applies to standard slides.

[3] Mounting holes or slots in press bed, for bolting bolster plate to bed, should conform to center-to-center distances on bolster plate, plus ¼ in. max, 1/16 in. min. clearance on any one side of slot or hole. Underside of slot or hole must be machined and must be parallel with the top of the bed.

FOR SMOOTHER QUIETER and MORE DEPENDABLE PRECISION BORING MACHINE OPERATION



EX·CELL·O uses the VICKERS* Magnebrake®

DRY MAGNETIC-PARTICLE BRAKE

Ex-Cell-O Corporation of Detroit, well-known manufacturer of quality machine tools, equips its precision boring machines with Vickers MAGNEBRAKE, because this unique braking equipment provides the important advantages of . . .

- **LONGER, TROUBLE FREE LIFE,** requiring much less brake maintenance than ordinary friction-type braking systems . . . thereby minimizing and in some instances, eliminating machine down-time. There are no shoes or linings in Vickers MAGNEBRAKES — nothing to wear out — your assurance of far longer, trouble free service life.
- **SMOOTHER, FASTER, QUIETER PERFORMANCE,** without troublesome grab or chatter. Since torque is independent of speed in the MAGNEBRAKE, stops are far smoother . . . thereby preventing transmission of brake vibrations through the spindle and to the work.

Vickers MAGNEBRAKES can serve you with the efficiency, dependability and durability needed for today's faster working duty cycles, higher operating speeds and higher inertia loads. Vickers engineers are thoroughly experienced in the application of industrial clutches and brakes. They will be happy to examine your problem and to offer competent engineering advice, without obligation. Write today for more detailed information.

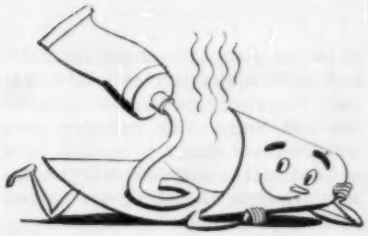
*TRADEMARK

VICKERS ELECTRIC DIVISION

VICKERS INCORPORATED a unit of Sperry Rand Corporation

1879 LOCUST STREET • SAINT LOUIS 3, MISSOURI

Talking Shop...



Ceramic Coatings

WHAT EFFECT does a ceramic coating on a metal used in an engine part have on the creep rate? The National Bureau of Standards reports that under some conditions it can reduce the creep rate as much as 50%. Tests of the NBS ceramic coating N143 on 80 Ni-20 Cr alloys showed such reductions at 1975 F and 600 and 1200 psi. However, at temperatures below 1800 F, the ceramic coating is not fluid enough to withstand high strain rates (such as 2200 psi) and the coating cracks.

Tool Signature

DO YOU KNOW, by heart, the standard tool signature? It has come into increasing use in recent years and more and more cutting tool people are learning to use this standard short cut. We use it from time to time, but have usually felt it was necessary to spell out the identification to make sure all our readers fully understood what we were talking about. It you don't know the standard signature yet, why not take a few minutes now to memorize it. There are seven elements to a tool signature and they are *always* listed in this order:

Back rake
Side rake
End relief
Side relief
End cutting edge angle
Side cutting edge angle
Nose radius

It may help you get it straight initially to remember back-end before side, rake before relief.

Oil-free Bearings

TACKLING THE PROBLEM of an instrument bearing that will operate at subzero temperatures, such as may be encountered in high-altitude flight, has led to a promising solution at the Bureau of Standards. The bearing is lubricated with a mixture of two plastics, neither of which is satisfactory alone. They are called PTFCE and PTFE. These plastics are polytrifluorochloroethylene and polytetrafluoroethylene respectively, which explains why the Bureau prefers initials. Another promising material is PTFE containing a filler of molybdenum metal powder. We are glad to see progress on this problem; now let's find a bearing that will work at the high speeds and temperatures that the next round of redesign is going to require in machine tools.

About Argon

IN THE LAST DECADE the demand for argon has multiplied considerably, mostly for use as a protective atmosphere in welding. Argon is reported to be more popular than helium for this purpose today. The argon is obtained from the atmosphere by compression and differential distillation. Most of the argon is used in welding aluminum and magnesium, but is also required for stainless steel, titanium, zirconium, and the nuclear metals. To some extent, however, argon protection is used in welding mild and alloy steel where high quality welds are essential. There seems to be some possibility that argon use will expand, further complicating the difficulties of meeting the demand.

Impossible!

AT THE MOMENT we are lost in envy of our associates who work in laboratories. They seem to be the only people who, at least partly, have avoided inflation. We conclude this after Chicago Apparatus Co called our attention to some of their prices 50 years ago and today. Bunsen burners are up from 22¢ to 90¢, but crucible tongs are down from 33¢ to 30¢ and rubber stoppers are down from $2.00 per pound to $1.75 per pound. But even they have troubles as the result of progress. Such new items as a recording spectrophotometer, unknown 50 years ago, retail at $8,825. That sounds more familiar.

Freeze Powdering

WHEN COOLED to very low temperatures by liquid nitrogen, many materials take on unusual properties· rubber is hard enough to machine, while many metals become brittle. This characteristic has been exploited by British Oxygen Research & Development Ltd to grind nylon and polyvinyl chloride to a powder. Stainless steel high-speed hammer mills are fed by cooled particles from a heat exchanger. Normally these materials can't be ground up without generating enough heat to cause molecular degradation. The developers call the process "freeze grinding."

Island Metalworking

WE TALKED, recently, with a visitor from Italy who was planning to open a metalworking plant in Puerto Rico. Seems the original plan was to save money by manufacturing in Italy for export to the US. However, while hourly direct-labor costs in Italy are much lower, indirect costs in taxes, government benefits, and special charges raise the costs near those in the US—and the skill available per labor "dollar" results in lower production and higher rejects. Top-notch mechanics are hard to find and get high pay. The resulting restudy showed Puerto Rico, with its long-term tax advantage, as a more practical place to locate.

Navaho Missile Kiss-off Augurs Heavy

WASHINGTON — The administration drive to put the lid on federal expenditures is taking hold—and military hard goods producers are feeling the squeeze (*AM*, July 1 '57, p126).

The latest cut: cancellation of the Air Force's contract with North American Aviation to develop the supersonic intercontinental Navaho guided missile, a nine-year project still in the development stage.

The decision will kill an estimated $300 million in new business for NAA and its suppliers—notably metalworking equipment makers—over the coming year. The funds would have been spent for continued research activities, manufacture of prototype models, and for purchase of production tooling. By the time cancellation details are ironed out, the Air Force will have poured at least $650 million into the Navaho.

Stretchouts, Too

The Navaho cancellation is the most recent and biggest cutback of a series of Pentagon decisions to slow down defense production. At least eight major aircraft and missile projects have been stretched out —for instance, Boeing's B-52 bomber, KC-135 jet tanker, and Bomarc missile; Convair's F-106 fighter-interceptor; Martin's Matador missile; Douglas' C-133 transport.

In addition, the Navy's order for Martin Seamaster jet seaplanes was reduced by one-fifth and contracts with Lockheed and Douglas for development of improved long-range early-warning and carrier attack planes were cancelled.

Machine Tool Orders Cancelled

The Navaho cutback won't hurt as many subcontractors and suppliers as would cancellation of some other major missile systems. NAA itself will take the biggest beating; the company was developing and producing the airframe, rocket engine, and electronic guidance for Navaho.

Still, there's the impact on makers of production equipment who were looking for future volume output of the new missile. Reflecting cutbacks in other missile and aircraft projects, for instance, the Air Force has cancelled about $10 million worth of advance orders for giant milling machines with Lewis & Giddings and Cincinnati Milling Machine Co.

According to Pentagon insiders, Navoho's cancellation is a sign of things to come. Says one of them: "In the past, when we talked of cutbacks to be made, there was a feeling in the bigger companies that this was the usual Washington flak and wouldn't touch them. The Navaho decision gives them something to chew on."

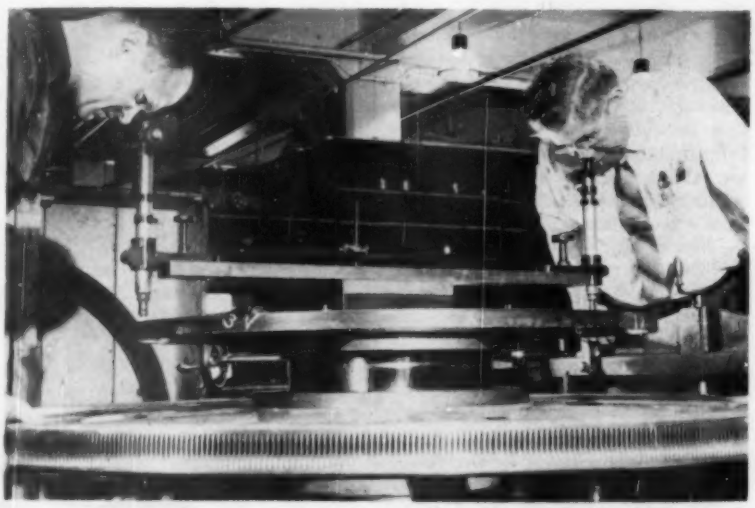
Fear Morale Drop Elsewhere

But both Defense Dept and industry officials are reluctant to talk specifically about other upcoming cuts for fear of hurting employee morale on projects still under way. As one official puts it: "Everything comes apart at the seams when such talk gets started." Still the fact remains that many weapon projects are to be cancelled or indefinitely postponed in the months ahead.

Some weeks back, the Air Force called in over 100 executives from at least 50 major producers to a special Pentagon conference to give the bad word. The industry men were warned that:

- Contract cancellations and stretchouts were in the offing for lesser-priority projects.
- Cuts must be made in overhead and engineering costs and the lid put on unit costs of missiles, planes, and components.
- The production transition from manned planes to guided missiles will be speeded up at least a year under pressure from the new budget policy, that the product mix of Air Force procurement—and the types of producers—would change sharply. For the near future, a one-third cut in aerial engine procurement—notably turbojets—and a near doubling of electronic buying were forecast.

Behind these warnings is the administration's order to hold military expenditures in the new fiscal year down to last year's level of about $38 billion. Since current spending runs



720 Individually Machined Teeth in One Gear!

This worm gear, part of the sidereel drive for a 36-in. reflecting telescope being built by Cleveland's Warner & Swasey Co for the Case Institute of Technology, has no fewer than 720 individually machined teeth. Each tooth requires a pitch diameter tolerance of 0.001 in., and total accumulated error in location for all 720 gears has to be held to 0.0002 in.—or 1/50th the diameter of a human hair. Here, technicians with microscopes optically locate each tooth position with reference to a circle scribed with a dividing engine, before cutting. The fabricated bronze gear will be mounted on the polar axis of the telescope

Cutbacks in Military Hard Goods

well over this level, the cutbacks are shaping up. Actually, the administration's order now applies to all government agencies, not only the Defense Dept, and affects "obligations" —that is, new contract awards—as well as actual cash outlays. But the impact will be greatest on the Pentagon, which accounts for way over half of federal expenditures and whose expenditures are flowing over initial estimates and threatening the slim federal budget surplus.

The Last of Nine Lives

To many Pentagon officials the Navaho project has been something of a "nine-lived cat" in recent years; it was almost killed off many times before. Navaho is one of two big projects to produce an intercontinental "cruise" or air-breathing missile for use as an interim strategic weapon until the Intercontinental Ballistic Missile becomes operational.

Northrop's Snark Survives

The other is Northrop Aircraft's Snark, which was ordered into volume production by the Air Force a few weeks ago. Snark is essentially a pilotless heavy bomber, is powered by a Pratt & Whitney J-57 turbojet engine (at subsonic speed under 700 mph) and guided by a stellar-inertial system built by Northrop.

The Navaho was Good

Navaho is a superior missile. It's designed to fly at about Mach 3, is launched with a rocket engine and powered in flight by a ramjet motor. But Navaho lags far behind Snark in flight testing.

"Double Insurance" Expires

With the speed-up in the ICBM program, Navaho has been looked on as "double insurance"—something the Air Force can do without under current budget restrictions. So out it went. In scrapping the project, the Air Force stresses that Navaho "should not be considered a loss, but rather a superseded development from which useful benefits have been derived." The rocket engine developed by North American for Navaho is being enlarged for the ICBM, its inertial guidance system "has also contributed to other programs," says the Air Force.

AF to Liquidate All Costs

Navaho development has been carried out under a cost-plus-fixed-fee (6% of costs) contract which has been renewed annually. Like all Air Force development or production contracts, the Navaho agreement includes a "termination for convenience" clause under which the government has the right to cancel at any time. North American, however, takes no direct loss from the cancellation. The Air Force is committed to liquidate all costs for work in process, inventories, and the like.

Lots of details will have to be ironed out over the next few months under the termination settlement. The Air Force still hasn't sent detailed close-out instructions to North American. Still to be determined is whether the cancellation is to be a gentle phase-out—with the company allowed to chew up parts and material already on hand and to flight test Navaho prototype missiles now at the Cape Canaveral, Fla, test center—or whether it's to be a complete halt for all work.

Then to be negotiated is the matter of remaining plant inventories for Navaho. The Air Force may take title to certain equipment and require North American to dispose of the remainder. On these decisions rest the termination costs which the Air Force will pay North American.

. . . and it's put Los Angeles into the labor-distress "gray" category

LOS ANGELES—"Let's make sure this one community isn't taking more than its share of the defense curtailment program," Los Angeles Mayor Norris Poulson has instructed California's Senators.

The reason: some 6395 workers have already been laid off at North American Aviation, directly or indirectly because of the government's overnight cancellation of the Navaho guided missile project, and by the time the firing and layoffs have died down, 15,600 NAA workers in all will have gotten the axe.

Can the Los Angeles area absorb the discharged employees, who range from top project engineers down to production line workers? Local aircraft people are in disagreement over the answer. Lockheed and Douglas, for instance, say they're not in the market for production workers, although they could use a few highly skilled people. Northrop, whose Snark missile production survived the purge, is doing some hiring.

And while the always-optimistic Los Angeles Chamber of Commerce says the area can absorb the discharged workers, cold statistics show that during the last few months the Los Angeles area for the first time in years has shown a decline in aircraft and manufacturing employment. Too, with the cancellation of its Navaho project, North American terminated $35 million in orders with 2680 suppliers (900 of them in the Los Angeles area). That sifts down to erasure of some $85 million a year from prime, sub and supplier payrolls.

While only 5300 North American layoffs so far are directly attributable to Navaho layoffs, the cutback has affected and will affect many more area aircraft workers indirectly. The balance of the 6395 dismissed workers, for instance, were let go because of general cutback in North American's 51,000 local workers. First to go were workers once held in reserve for F-107 work, who when that canceled out were switched to Navaho. Not only that, the only military aircraft production contract in the Los Angeles area, North American's F-100, will phase out soon, too.

But North American is hoping for a last-ditch rescue in the form of new military aircraft contracts before it has to dismiss the anticipated 15,600 workers. Meanwhile, Los Angelenos are plenty worried—despite "everything's OK" Chamber of Commerce reassurances.

Senate Probes Metals Industry Pricing

WASHINGTON — A broad and sweeping inquiry into the way business sets its prices—and why changes are made when they are made—is getting underway in Washington, conducted by Senator Estes Kefauver's Antitrust and Monopoly Subcommittee.

Metal-producing and metalworking industries are first in line.

The inquiry opened just as the controversy broke over the subcommittee's new report on industrial concentration (*AM* July 15 '57, p172) and less than a month after the $6 a ton price increase in steel.

The first round of witnesses—all economists—pitched their testimony on such touchy subjects as "administered prices," "price leadership" and "industrial concentration."

Farm Machinery, Steel Next

After that, Kefauver will tackle steel, which everyone is interested in. Farm machinery is next. And the Subcommittee plans hearings into aluminum and autos, too.

The Committee hasn't yet tipped its hand clearly as to just how it will go about all this. But there's little doubt that it's feeling its way to search out companies, commodities, and situations that will support its feeling that businessmen have raised prices unnecessarily.

Economist John R Moore of the University of Tennessee pointed out that the economic situation that prompted Kefauver's look-see into prices is just the opposite of that in the 30's when "administered prices" first became politically hot. Then the issue was prices going down too slowly during a period of deflation; now it's prices going up too fast during a period of inflation.

So far, there's almost no schedule laid out. But the Committee has advertised that its first interest is steel —and it will begin by calling in U S Steel's Roger Blough.

Kefauver will ask Blough just how he fixes the price of his company's steel—and what makes him change or resist change and why.

The impact of big business-big labor wage-setting on the economy will be explored and current fiscal and monetary policies are in for a going-over—all in the light of present inflationary conditions.

In Kefauver's words, the Subcommittee wants to find out how much discretion big industry has in setting prices at alternative levels, what effects this may have on inflation and production and employment, and what public policy should be towards the exercise of any such power.

Actually, no one expects that legislation will result from the hearing —no matter how long it lasts or how rough it becomes. But at least one suggestion has already been heard: that all major industries and unions be required to appear before Congressional committees before any major wage increase or price increase is put into effect—rather than after the increases have been adopted.

The lever the Kefauver Committee is using to pry into this far-reaching economic inquiry is known to economists as "administered prices."

Because he fathered the term back in the 1930's, the definition used by Gardiner C Means—now an economist with the Committee for Economic Development—pretty much was adopted by the four other leading price economists who opened the investigation.

Means' definition: "An administered price is a price set by someone, usually a producer or seller, and kept constant for a period of time and for a series of transactions." The opposite is a market price, one that fluctuates on the basis of supply and demand as these forces are felt in the market.

Big Business Not "All Bad"

Means' thesis about the inflexibility of administered prices to fluctuations in demand during the depression of the 30's has been identified as a characteristic of highly concentrated industries. But Means and John Galbraith—Harvard economist who emphasized the power that firms in a highly concentrated industry have in controlling their prices —both deprecated the idea that there is something inherently bad about either administered prices or big business.

Means—and the other economists for that matter—generally did not deal in specific illustrations, but Galbraith noted that the steel industry could have raised the price of steel six months or even a year before it made its most recent price increase announcement—but merely chose not to, even though the steel market previously had been even stronger than now.

Means presented to the Subcommittee his own chart of Bureau of Labor Statistics wholesale prices, which he says shows administered prices have risen since about the middle of 1955, while the so-called "market" prices were stable or falling. And to Means and Galbraith, the price rise since 1955 has been at least largely the result of action within the area of discretion in which prices and wage rates are made—and not because of excessive buying power.

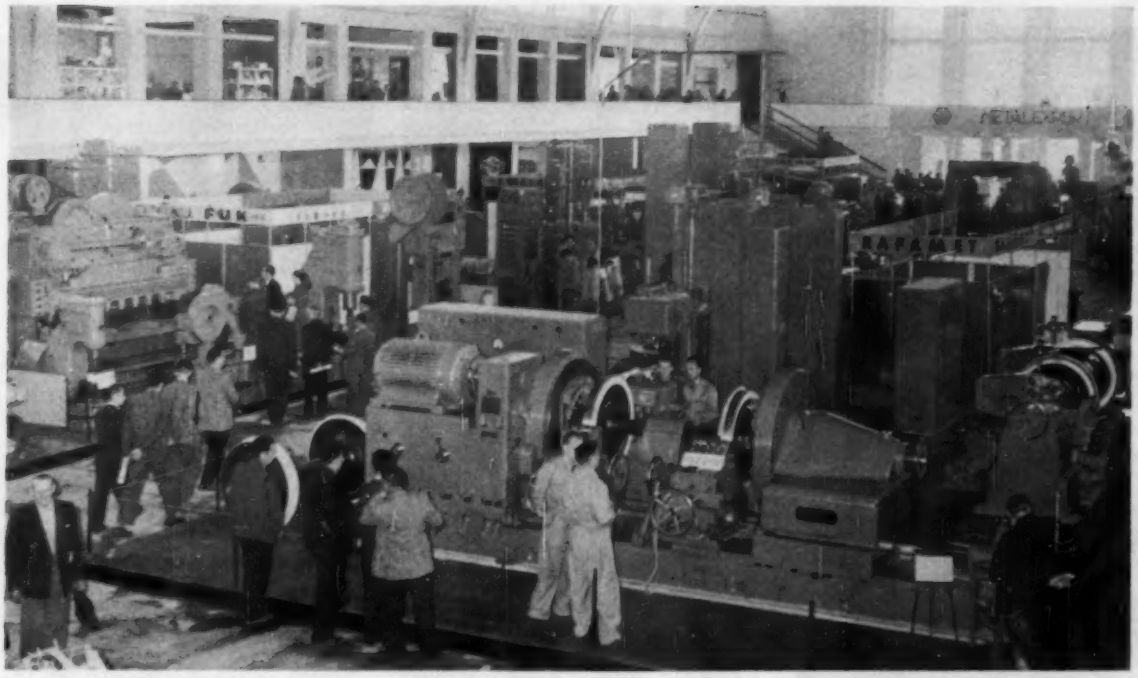
"Area of Discretion"

The economists appearing before Kefauver agreed—despite differences in personal views—that the Committee would do well to get the facts on this elusive "area of discretion" and devise methods for reducing any danger that such discretionary power might be used against the public interest.

Very few ideas on how this could be done were offered. All agreed that all-out trust-busting was not any answer. All agreed—for different reasons—that current tight money and fiscal policies are not and cannot control the present inflation.

Means, at least, agreed with Subcommittee Chief Economist John Blair that price increases at the present time will be accompanied by some decline in output and employment—the closest any interchange in the hearings has come to suggesting that behavior of administered prices under present economic conditions may tend to aggravate any down-swing that could occur in the future.

All the economists seemed to approve the "jawbone" measures of the administration in trying to persuade business and labor to keep prices and wage demands in check. But Moore caustically commented, "The 'new statesmanship' simply means that it is easier to explain a wage and price increase to a Senate Committee than to explain a policy of holding the line to a union and to the rank-and-file."



Section of Poznan Fair's Metalexport Hall . . . exhibited machine tools on the stands of individual factories for the first time, and where engineers for the first time, too, were allowed to look over the exhibits. Formerly, only trade officials were permitted to inspect the machines. Railway-wheel turning lathe in foreground is the latest version of a longtime Polish specialty. Suitable for several track gages, lathe has interchangeable profiling cams for mechanical copy-turning, 12 spindle speeds from 2.34 to 17.72 rpm

Poland Eyes Western Tool Market

–As Russia and the West Vie for Her Favors at Poznan Fair

POZNAN, POLAND — This year's Poznan Fair, held here in June, was a two-sided showcase for consumer and industrial goods—with 1400 Western firms on the one hand eager to crash Poland's lucrative potential market for hard goods, and Poland on the other hand eager to push its own exports to Western nations as a means of meeting new credit obligations and of paying for future imports.

Clearing the way for large-scale free world interest in the Polish market was the first appearance at Poznan of American goods. The U S exhibit, staged by the Department of Commerce, was an eye-opening display of American consumer goods that made Polish jaws drop—although many observers thought that the U S exhibit was overdone politically in contrast with those of Germany and Britain, which emphasized industrial goods of a purely commercial nature carefully keyed to Poland's basic economic needs. These are officially listed, in order of priority, as mining machinery, textile machines and vehicles.

Few Western Tools Shown

Machine tools were not prominent among Western exhibits, although a few were presented by French, Italian and Austrian firms. But a major market for machine tools may shape up in the future if Poland follows through with its plans to manufacture machinery and equipment under foreign license.

If and when credits become available, Poland may buy machines as well as tooling to make truck engines and passenger cars (French and Italian licenses), tractors (British and German licenses), 8000-hp marine diesels (German), and coal-mining machinery (French). Poland has already done this sort of thing at its Warsaw and Lublin auto and truck plants, which were built entirely and financed by Russia.

While such developments are still in the embryo stage (because nearly two-thirds of Poland's imports are from the Soviet Bloc), there are today indications of a gradual shift in Poland's trade pattern. Buying of capital goods from Russia will be reduced substantially as Poland slackens its breakneck industrial expansion pace to consolidate its gains.

Poland's Drive to the West

At the same time, Poland is striving to push its exports to the West. Exports of metalworking products in 1956 to all countries totaled $300 million. This year, the goal is somewhere around $390 million.

Poland's 1956 machine tool ex-

FOREIGN REPORT

Carbide tool grinder . . .

has an elastic infeed that maintains constant pressure of cutting edge against wheel, also allows grinding tip and shank at same clearance angle, cuts wheel wear, eliminates diamond dressing. Grinder handles tool shanks up to 1.25 by 2.36 in., maintains contact pressure of 145 psi

ports, valued at $6.3 million and numbering about 1000 units, were a third higher than in 1955. Further increases are planned for this year. Toward that goal, machine tools were displayed at Poznan by individual factories, rather than in a blanket display by Metalexport, Poland's state-run trade organization—as in the past.

Direct Builder Contact Encouraged

This method is designed to facilitate direct contact between the machine tool plants and their potential customers. Poland's machine tool plants now have more independence. Metalexport steps in only to sign and implement contracts. Another businesslike Polish move has been to revert to the former names of factories. For example, ZISPO (the "Stalin Works" in Poznan where the riots started last June) is once again called "Cegielski."

Exports Mostly to Soviet

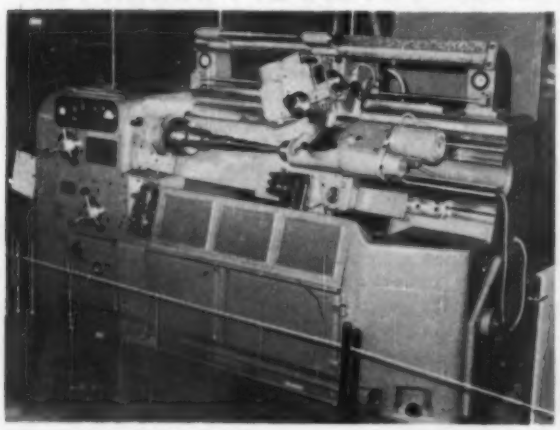
Poland's machine exports to non-Soviet nations have thus far been mainly to India and other Asiatic countries, although recently some headway has been made in the South American market, some customers have turned up in West Germany, and 50 machines were recently shipped to Britain. Now Canada is being probed as a market and Metalexport has sent over a representative to survey its potential, to appoint an agent and perhaps set up a display.

Poland's current production of metalworking machinery in 24 factories is reported to be about 19,000 units, with a gross weight of 37,000 tons. Output is concentrated on basic types, although some fairly advanced models (see accompanying photos) were displayed at Poznan—including components for an automated transfer line, a new single-spindle automatic, and a hydraulic copying lathe.

The Wooing of Poland

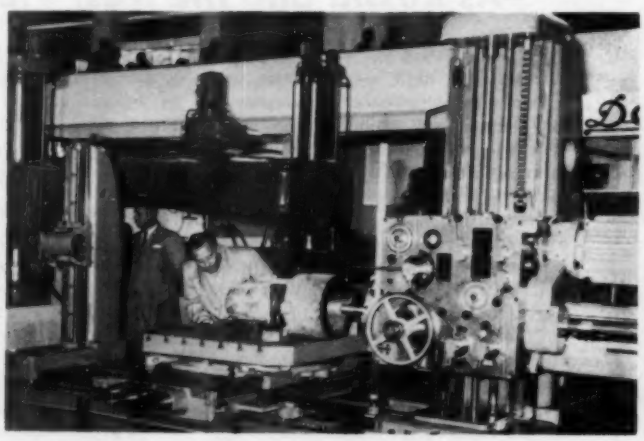
As a source of international trade, Poland today is being wooed by the West and the East, and as a result is amassing credits to finance imports. The United States, for instance, has offered $95 million credit to Poland, largely for farm products. But this nod from America has prompted France to advance the equivalent of $28 million and Austria $5 million for capital goods.

British banks are understood to be considering credits of $140 million, and the West German government broke the diplomatic ice during the Fair by sending an official delegation to Warsaw for the first time to talk credits and trade. And all this is on top of the $375 million recently received by Poland from Russia, East Germany and Czechoslovakia.



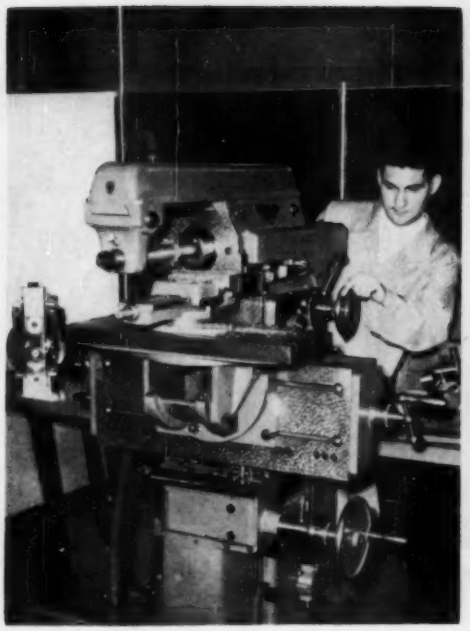
Poland's newest copying lathe . . .

has a system of stopdogs that automatically control depth of cut and spindle speeds when rough-turning stepped shafts up to six dias, prior to finish copy-turning from the master. Spindle speeds are infinitely variable from 224 to 1120 rpm in two stages. Maximum swing is 3.93 in., distance between centers 29.52 in.



Horizontal boring and milling machine . . .

has a 3.15-in. spindle, features mechanical preselection of 18 speeds and 32 feeds. Micrometer stops insure accurate table and spindle head positioning for repetitive work. Vertical leadscrew on tailstock support is linked by shafts and leadscrews to spindle head for simultaneous elevation and alignment. Cuts metric, English threads

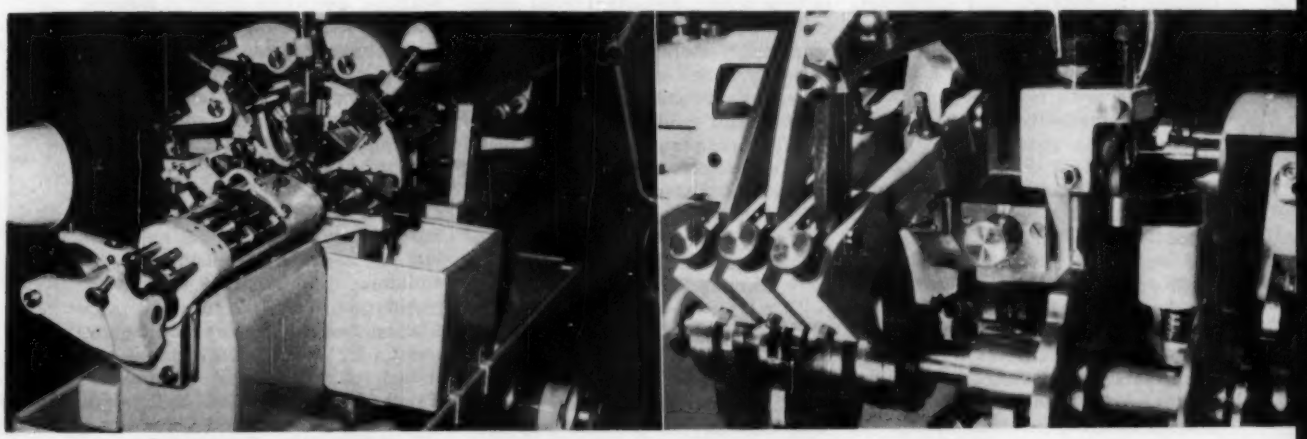


Small universal miller . . .

has a 700-mm x 260-mm tilting table, is offered with a dividing head, slotter and other attachments. Eight spindle speeds range from 110 to 1230 rpm vertical, and 150 to 1660 rpm horizontal. Feeds in eight steps are from 1 in. to 11.22 in. per min. Finish of this and other Polish machines shown at Poznan showed a great improvement

Standard Polish units for automatic transfer lines . . .

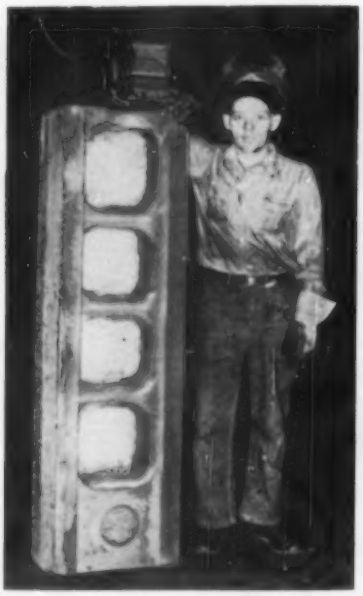
shown at Poznan Fair. Typical single-station at rear and the two units at right illustrate the four basic sizes of heads used for drilling, boring and milling. Strokes range from 9.84 in. to 39.37 in., and feed force from 3527 to 22,000 lbs. Alternate motors are available for each type, giving driving shaft speeds of 355 or 710 rpm. The two small tapping units at the left are cam-operated. Built at Pruszkow, this equipment is designed primarily for electric motor housings. Included in the exhibit was a typical line with five work and four inspection stations, and an under-bed platen-return conveyor. Three such lines are said to be in use in Poland



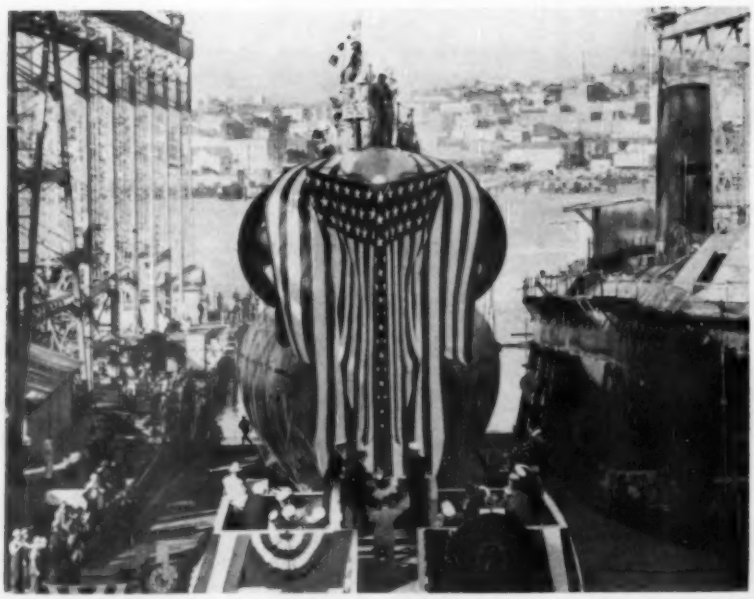
Poland's newest single-spindle automatic of 4-mm bar capacity . . .

carries two of its five cross tools on a common pivoted arm instead of on slides. This allows turning of up to 3 diameters with a single tool without resetting. The arm is positively located during the work cycle by adjustable stops that are alternately positioned by an indexing striker bar operated by the camshaft—allowing variable depth of cut. The other three cross slides have micrometer adjusters. Optional equipment includes a drilling head with 1, 2 or 3 spindles, and attachments for taper turning, slotting and threading. Maximum turning length is 1.97 in. and spindle speeds range from 2000 to 12,000 rpm in nine steps

FIELD REPORT



700 closed-die forgings . . .
like this one, which weighs 2750 lb, were used to break an automotive-glass production bottleneck. "Table feed rack" forgings, designed and made by Cleveland's Park Drop Forge Co, were especially designed for a new kind of glass-making machine



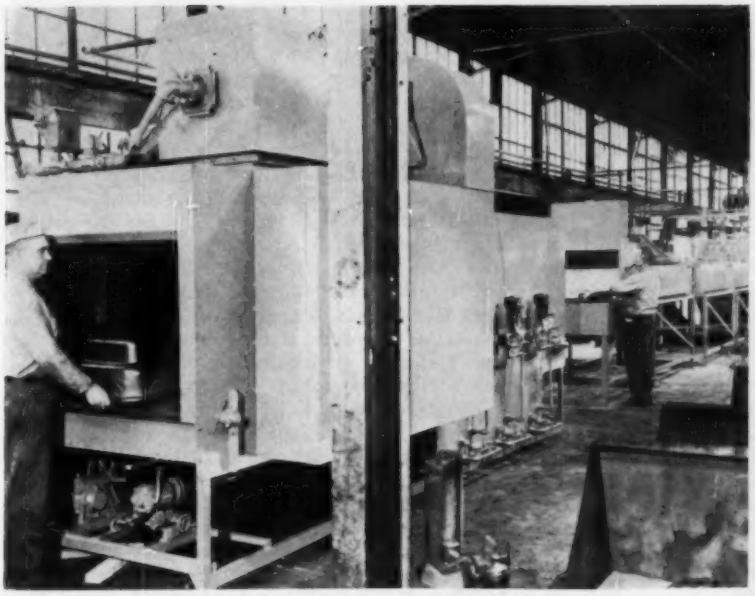
Missile Sub Launched . . .
Under construction for more than three years, Navy's missile submarine Grayback is launched at Mare Island Naval Shipyard, Vallejo, Calif. Grayback's midsection, incidentally, which houses the missile launcher, was an afterthought. Decision to equip her to launch missiles came while the sub was under construction, so the hull was cut in half and a 50-ft section sandwiched in to accommodate the missile hangar. The diesel-powered Grayback was christened by Mrs J A Moore, widow of the skipper of the original Grayback, lost in World War II

East...

Looking East . . .
General Electric's Philadelphia plant is carrying out the $158-million AF contract to develop nose cones for the Atlas and Thor missiles. Over 300 suppliers and subs within a 50-mile radius of Philadelphia are supplying GE with material and services . . . **Minneapolis-Honeywell Regulator Co** has opened a new $1.5-million plant at Fort Washington, Penna; it'll produce industrial valves for automation and the missile program. **M-H** is transferring machinery and equipment from the division's facility in Philadelphia . . . **Daystrom Inc** has set up **Daystrom, Ltd,** in Toronto to handle sales, service, assembly, and manufacture of electronic products in Canada . . . **Luria Brothers Inc,** Philadelphia, is getting a scrap shearing machine with pressure of 1200 metric tons. The automatic unit, reportedly biggest in the world, was made by the German firm, **Lindemann Maschinenfabrik GMBH,** Duesseldorf . . . **Vertol Aircraft Corp,** Morton, Penna, has set up a subcontract department; they're ready for government work in aircraft, missiles, and electronics . . . Boston Ordnance District of the Army has started a drive to channel more research and development contracts into New England firms. District is now handling more than $62 million worth, feels that a lot more companies should be sharing in the work . . . **Aeroprojects Inc,** West Chester, Penna, has set up a subsidiary, **Sonobond Corp**—it'll manufacture, sell, and service ultrasonic metal joining equipment developed by **Aeroprojects** . . . **Dresser Manufacturing Division,** Bradford, Penna, one of the **Dresser Industries, Inc,** has completed a new million-dollar compression fitting plant in Wellsboro, Penna.

South...

Briefs from the South . . .
Unidentified eastern electronics firm is considering Nashville, Tenn, as possible location for a plant which would employ up to 5000, require a million square feet of manufacturing space . . . **Turley Machine Works,** Chattanooga, has a five-year expansion program in the works for making, blanking, drawing, and forming dies, plus general machine work and tool grinding . . . **Westinghouse Electric Corp** will put up a new manufacturing and repair plant at Charlotte, NC. The 24,000-sq-ft facility will be completed by middle of next year . . . Executive offices of **Robertshaw-Fulton Controls Co,** now at Greensburg, Penna, will relocate in Richmond, Va, in the fall . . . **Ross-Meehan Foundry,** Chattanooga maker of wheels, hubs, and driving mechanisms for the medium tank, is a subcontractor for the $119-million government tank order placed with **Chrysler Corp** at Newark, Del . . . Fabricating and distributing plant will be opened at Knoxville by **Childers Manufacturing Co** of Albuquerque, NM. It'll turn out circulating hot oil heaters and equipment for road contractors and industrial heating . . . **Aluminum Taper Milling Co** of Tullahoma, Tenn, and the **Wheland Co** of Chattanooga have Navy contracts to provide new sculpture milling capacity for aircraft fuselage manufacture. Process involves molding aluminum sheets to provide one-piece non-riveted airframes . . . **Interstate Machinery Co** of Chicago has opened a



New annealing furnace, soap coater for Worcester . . .
Worcester Pressed Steel Co's new annealing furnace (foreground) can treat 700 lb of stampings per hour, works in conjunction with an automatic soap coater (background). The furnace, which can handle low-carbon steel, stainless and non-ferrous metals, achieves a maximum of 2050 F, is equipped with a 30-in.-wide conveyor belt and a 12-in.-high entrance door. Annealed stampings are lifted automatically from the furnace into the coater, where they are sprayed with a lubricating coat of soap, which is dried in the coater's oven

Watch-repair hobbyist . . .
is Lunkenheimer Co's Cyril R O'Connor, Sr, assistant foreman in the Cincinnati firm's toolmaking and repair department. Mr O'Connor, who willingly takes on jobs turned down by professionals, uses a jeweler's eyepiece, precision instruments (including a tool for replacing and setting jewels, and a 130-piece staking tool) to clean and repair all makes and types of watches in his home. Here Lunkenheimer's Janet Huninghake takes advantage of O'Connor's skill during his spare time to get her watch fixed. O'Connor, who makes many of his watch-repair tools himself, works with big tools and machinery on the job, then works with "little stuff" after hours—a hobby he started back in his 'teens. Incidentally, he has repaired the bosses' watches, too—those of President Paul M Arnall, and VP Elbe W Dick

new office at 1000 Peachtree St, NE, Atlanta, Ga. Herb Kempler, Interstate sales engineer for the past 17 years, will be in charge as Southern Division manager . . . **Cobble Bros Machinery Co,** Chattanooga, has bought the Punchwork Division of **Van Dyke Textigraph Corp,** also located there . . . **Smith & Bridges Machine Co,** maker of textile machinery, has opened up in Chattanooga . . . Latest and largest addition to the tooling expansion program of **J B Beaird Co,** Shreveport, La, maker of heavy steel products, is a Betts vertical boring mill with 108-in. table. The 35,000-lb mill, with 47-in. clearance under the cross rails, is currently being used to machine 6½-ft-dia flanged and dished heads of tank car tanks ordered by **North American Car Corp** . . . **Powermatic Machine Co,** McMinnville, Tenn, machinery manufacturer, has expanded plant floor space to 85,000 sq ft.

Midwest...

Around the Midwest . . .
Illinois Gear & Machine Co is spending $2 million (more than half of it for heavy machine tools) on expansion of its South works in Chicago. Program, scheduled for year-end completion, includes a 16,000-sq-ft addition to its high crane bay building, trebling size . . . **Westinghouse** Y and G unit air compressors are coming off the new production line at the Greenwich, Ohio, plant of the **Le Roi Division** of **Westinghouse Air Brake Co.** Direct control of manufacturing as well as marketing by **Le Roi** will speed up deliveries; units were formerly made by the **Industrial Products Division** at Wilmerding, Penna . . . **Standard Railway Equipment Manufacturing Co,** Chicago, is considering acquisition of **Southwest Manufacturing Co,** Little Rock, Ark, maker of aluminum boats. Cash offer in excess of $1 million is reported . . . **Jansson Gage Co,** Detroit, is offering a new service to gage block users; they'll produce special size blocks in either English or metric measure, made to specifications, in practically any material . . . **American Motors** has wound up production of 1957 model Nash and Hudson cars, will continue Rambler output. Company has assembled some 56,800 cars so far this year, 52,000 of them Ramblers. **American Motors of Canada** is closing down its Toronto plant, will supply the Canadian market from Kenosha, Wis. Company hopes to build a new production facility in the Toronto area within two years, provided the American parent company is in the black next year . . . Capacity ratings of **Timken** roller bearings have been increased by approximately 10% (some series as much as 39%). New ratings may make it possible to use Timken bearings in applications formerly not practicable . . . **Consolidated Foundries & Manufacturing Co,** Chicago, has taken over the investment casting business of **N A Woodworth Co,** Detroit. Woodworth will continue its

FIELD REPORT

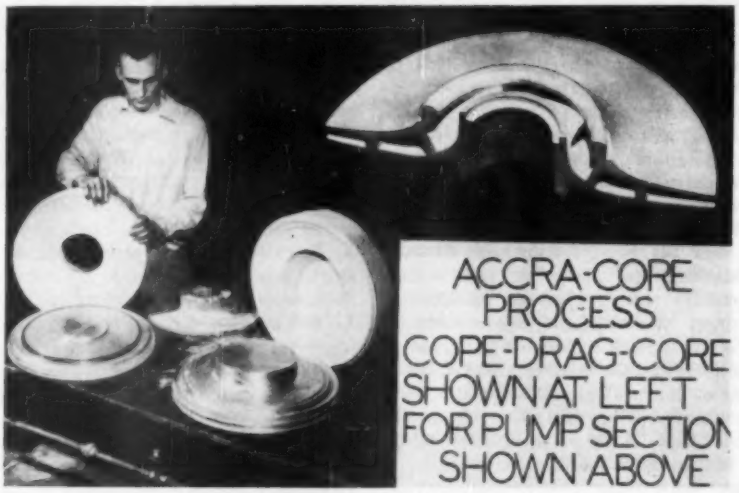
manufacturing and machining operations . . . **Aluminum Co of America** has completed a $54-million expansion at its Davenport, Iowa, works. New production units include a 160-in. hot mill, widest in the industry; plate stretcher with pulling force of 16 million pounds; $13-million foil rolling facility with annual capacity of 24 million pounds.

West . . .

Western newsnotes . . .

Boeing Airplane Co will concentrate all B-52 jet bomber assembly at Wichita, Kan, after the fall of '58; Air Force has approved the idea in principle. Seattle plant will continue to fabricate and assemble components, with final assembly to be completed at Wichita. Some components of the IM-99 Bomarc interceptor missile, originally scheduled for Kansas manufacture, will be made at Seattle . . . **Continental Can Co** has optioned property in Merced, Calif, hopes to put up a $3.5-million plant there. Hitch is that an interchange would have to be built between the Santa Fe and Southern Pacific RRs . . . **Rohr Aircraft,** San Diego, has been named sole manufacturer of struts and power packages for advanced model of Boeing's B-52 jet bomber. The $21-million order brings Rohr's backlog up to $250 million; work will be done at the Chula Vista plant . . . **International Glass Corp,** Culver City, Calif, and **Cascade Research Corp,** Los Gatos manufacturer of electronics equipment, will merge if stockholders agree. Operations of both firms will be combined in a new plant to be located on a 17-acre site in Campbell, Calif. **IGC** also has merger in the works with **Timm Aircraft Corp,** plans to operate it as a division . . . **Food Machinery & Chemical Corp,** San Jose, will build a 14,000-sq-ft addition to the Ordnance Division's engineering facilities. New wing, scheduled for 90-day completion, will house 200 engineers working on missile-launcher projects . . . Ralph G Fear of **Shearcut Tool Co,** Reseda, Calif, has written in to rescind a news item (*AM*—July 15, p248) announcing that authority to assume management of the company had been taken over by Shearcut's assistant general manager. No truth to it at all, says Mr Fear, who, as sole owner, is still the boss . . . **Moore Development Corp,** Torrance, Calif, specialist in experimental and prototype fabrication of aircraft components, has had to add new equipment to its testing facilities because of current contracts and additional pending orders. Included are a high-temperature oven, low-temperature cold box, and Calidyne shake and vibration tester able to test to 100-lb force at 0-300 cps . . . **Westinghouse Electric's** plant in Sunnyvale, Calif, is building two geared steam turbines rated at 3300 hp. They'll power the T-AKD-1, a 465-ft icebreaker.

Two New Casting Processes Unveiled at Misco Muskegon



Mono-Shell Process . . . a new development at Misco Precision Casting Co's just-opened Muskegon, Mich, plant, makes ceramic shells to replace massive investment molds as mold cavities. A thick ceramic shell is built up around a wax cluster by dipping the cluster into a refractory slurry. This produces a monolithic ceramic shell, which when fired can be handled with tongs and clamped to the melting furnace in the same manner as an investment mold. Advantages: reduction of slag and dirt; permits use of higher pouring temperatures; cycle times for removing wax and preheating wax are reduced; and less material is required. Accra-Core Process (right photo) fills a gap between conventional sand casting and investment casting, achieves large castings with properties typical of investment casting. Cope, drag and cores are made from ceramic investment material. Quick-setting, high-temperature ceramic cement bonds refractory materials against metal pattern or matchplate. Mold sections are then oven dried and assembled as a complete mold, which is preheated to 1500-1700 for the pouring operation. Up to 150 lb of metal can be poured into these molds by shank ladle methods. Process allows effective casting of stainless and low alloy steel. Surface range from 150 to 200 RMS—better than sand casting, not as good as investment casting. Tolerances, too, are better than those of sand castings, but because of parting lines are not as accurate as investment castings. Typical castings: impeller wheels, turbine casings, housings

Accra-Core Process . . .

R G Ellis, chief engineer of Micromatic Hone Corp, has been named staff assistant to the vice president and assistant general manager of the firm

Frederick J Keller has been appointed director of sales of Vermont Tap & Die Co. He was formerly vice president of Midwest Tool & Cutlery Co

Walter L Rye has been promoted from sales engineer to plant manager of Cincinnati Gear Co, custom gear manufacturer (additional appointments below)

Names in the News . . .

Walter E Callison has been named manager of the Brehm Die Division of Vulcan Tool Co, Dayton, Ohio. Prior to joining the company he was an assistant manager of Steel Products Engineering Co.

R K Hoffman, manager of the Engineered Products Division of Acme Precision Products, Inc, Dayton, Ohio, has been named a vice president of the company which manufactures tools, dies, automated and special machinery.

Joseph W Eskridge, vice president, manufacturing for the Special Products Division of American Motors, has been appointed vice president and general manager of the Division. He succeeds **Stuart G Baits,** who is retiring.

William H Martin has been appointed president of Clevite Ltd, St Thomas, Ontario. As general manager, he directed establishment of the Canadian company, the only major producer of bushings and bearings in the Dominion. Mr Martin has most recently been serving as branch plants manager of Cleveland Graphite Bronze Co, largest of the Clevite group of companies.

Robert C Wright has been promoted from assistant chief to chief of production engineering at Pratt & Whitney Aircraft, East Hartford, Conn. He succeeds **Edward P Bullard III** who left the firm to become president and general manager of The Bullard Co, Bridgeport, Conn (*AM*—July 1, p131).

Lester A Edwards, a member of the sales staff of Cincinnati Gear Co, has been appointed sales manager. **Anthony J Lucas,** methods manager, has been named chief engineer in charge of methods, tooling, purchasing, and engineering.

Henry F Banzhaf has been appointed assistant to the general manager of the General Products Division of Allis-Chalmers Manufacturing Co. The division makes motors, pumps, and V-belt drives.

Donald F Levleit has been appointed general manager of Veet Industries, East Detroit, Mich, maker of radial drill machines. Mr Levleit was formerly factory manager of the Detroit plant of Continental Motors Corp.

W L Huber, manager of Diamond Tool Research Co, has been elected president of the Industrial Diamond Association of America (*AM*—July 15, p250)

Bernard S Reckseit, chief engineer of Ransohoff, Inc, Hamilton, Ohio, manufacturer of metal cleaning and finishing equipment, has been named vice president, engineering.

Frank A Depweg has been appointed manager of the newly created Special Products Sales department at the Hamilton (Ohio) Division of Baldwin-Lima-Hamilton Corp.

Robert F Treuer, vice president of Atlas Brass Foundry, Los Angeles, has been elected president and general manager. **Frank Anderson** has been named vice president and board chairman.

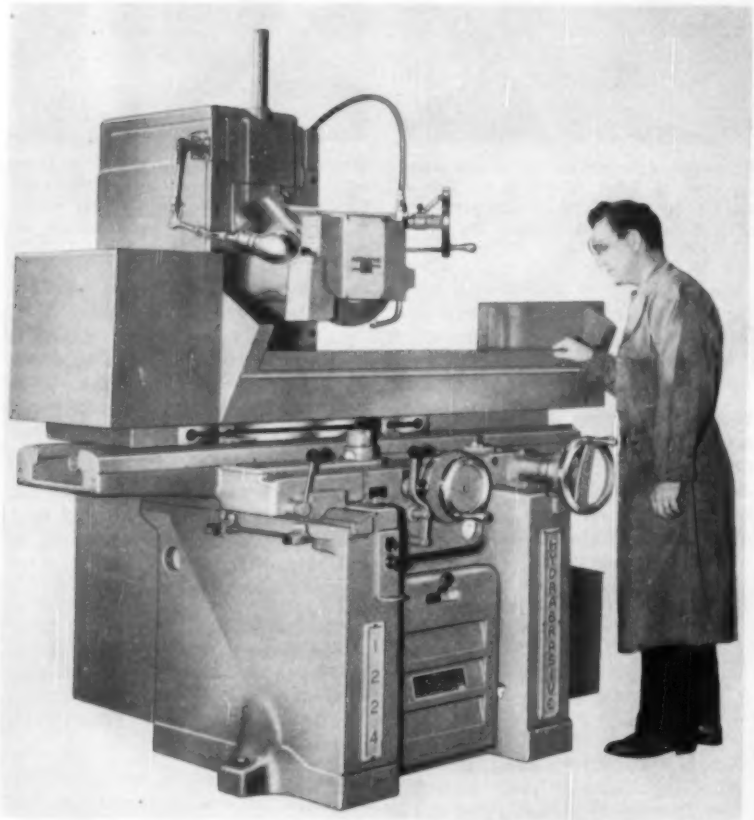
Gerald T Hughart has been appointed general manager of the Klemp Metal Grating Corp, Chicago. He was formerly manufacturing manager of Stearns-Rogers Manufacturing Co, Denver.

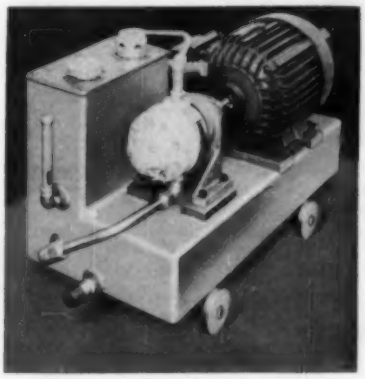
Chester C Lonsdale, assistant to the superintendent, has been appointed superintendent of the Hallowell Division of Standard Pressed Steel Co, Jenkinton, Penna.

OBITUARIES

Samuel R Swenson, 71, founder and board chairman of Midwestern Tool Co, died recently in Chicago. Mr Swenson, president of the company from 1922-1956, was a founder and member of the Tool & Die Institute of Chicago.

Winfred B Holton, Jr, 68, who retired recently as board chairman of the Walworth Co, New York valve and pipe fitting manufacturer, died July 12.





HYDRAULIC POWER UNIT rolls out the front of machine. Unit is cooled by air flow over system and up column, aided by TEFC motor

Line of Hydraulic Surface Grinders Is Designed for Toolroom Operations

Hydrabrasive line of hydraulic precision surface grinders offers many innovations including big capacity, new spindle design, low heat build-up, and a unique cross-feed saddle adjustment. Another outstanding feature is the "roll-out" hydraulic unit, which rolls right out of the machine for easy inspection and adjustment.

Capacity

Grinders are available in three sizes: Model 824, 8 x 24 x 12 in.; Model 1218, 12 x 18 x 12 in.; and Model 1224, 12 x 24 x 12 in. To provide flexible capacity, all standard models have 12 in. of grinding clearance to the table under a 12-in. wheel. Optionally, they can be built with 18 in. under a 12-in. wheel. The 24-in. models can be safely extended to 30 in. in length without sacrificing strength or accuracy.

Trouble-free operation

Hydrabrasive spindles are reported to be cool running, and are lifetime sealed lubricated. They are powered by special "soft-running" motors, and run on preloaded anti-friction bearings. To eliminate any possibility of binding on the column ways, the head and spindle assembly is balanced on the elevating screw.

Low heat build-up

There is no possibility of heat changing the dimensions of these surface grinders. Table is powered by two hydraulic-cylinder rams. Each ram is under pressure only half of the time—the remainder is spent at rest and cooling. The hydraulic system operates at 200 psi. System is small, compact and simple, and is easily removed for inspection and maintenance. Because it is a low-pressure, high-volume system, heat is not a problem; normal temperature rise in system is only 20 F. The inside of each machine is painted white so that heat reflects back into the cooling air stream. The coolant system is located outside the machine, eliminating heat transfer from that source.

Cross-feed

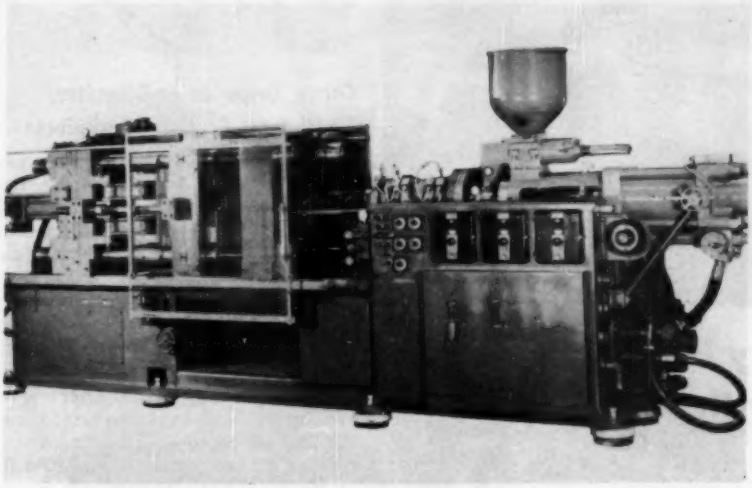
For highly accurate transverse saddle adjustment, machines have a precision-ground cross-feed screw with backlash eliminator and ball-bearing saddle ways. Hydraulic motor turns the screw for rapid saddle traverse when dressing wheel.

Designed for operator

All controls are conveniently grouped for natural, effortless operation, and are mechanically interlocked for positive safety. Elevating handwheel is located on head because it eliminates crouching to line up work.

Abrasive Machine Tool Co, East Providence, RI

Materials and Parts . . .



Injection Molding Machine Can Mold Wide Variety of Plastic Products

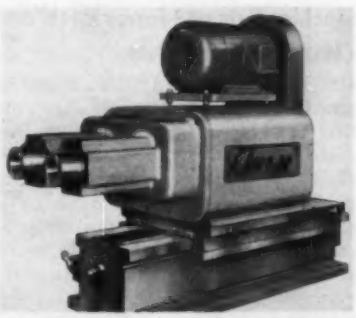
Fellows No. 12-350 injection molding machine is designed to mold a wide variety of plastic products in the intermediate size range of 12 to 20 oz, the 20-oz shots requiring the use of the optional Pre-Pac or stuffing device. Machine dry cycles at 700 per hr and handles mold bases up to 20 x 31½ in. with a 14-in. draw. It is equally capable of producing either deep-draw, thin-wall parts or heavier sections.

Heating cylinder plasticizes up to 150 lb of polystyrene at 420 F, plus or minus 10 F. Cylinder heat is controlled through three temperature controllers; nozzle temperature control is by heater band and rheostat, but an optional controller kit is available. Injection plunger is water cooled.

This hydraulically operated toggle-type press has a mold-locking pressure of 350 tons. It features a supported movable die plate with tie-rods which are preloaded at front end and easily pullable when necessary.

As optional equipment, the Pre-Pac or stuffing device and plunger pre-positioning or advance, for handling large shots and bulky materials, are available. As safety precaution, the standard control circuit requires operator to open and close door before next cycle will start, but an automatic molding kit is available to make entire molding operation automatic.

Fellows Gear Shaper Co, Springfield, Vt



DEEP DRILLING ATTACHMENT called Metric Torque-Matic, is said to eliminate drill breakage during deep hole drilling. Unit allows exact setting of torque on Avey deep hole drilling units and is calibrated so that a given number corresponds to the desired drill diameter. If torque is exceeded, drill is automatically withdrawn—*Motch & Merryweather Machinery Co, Avey Div, Cincinnati 1, Ohio*

...including

MACHINE TOOLS AND ATTACHMENTS

Hydraulic Planer 142
Ram-Type Milling Machine 143
Machine Control System 144
Heavy-Duty Drilling Unit 148
Boring Mill 150
Milling Spindle 154

TOOLS AND ACCESSORIES

Pinch-Jaw Chuck 142
Work Positioner 142
Ball-Bearing Chucks 143
Quick-Change Tools 143
Setup Fixture 144
Bar Feeder 146

WELDING AND HEAT-TREATING

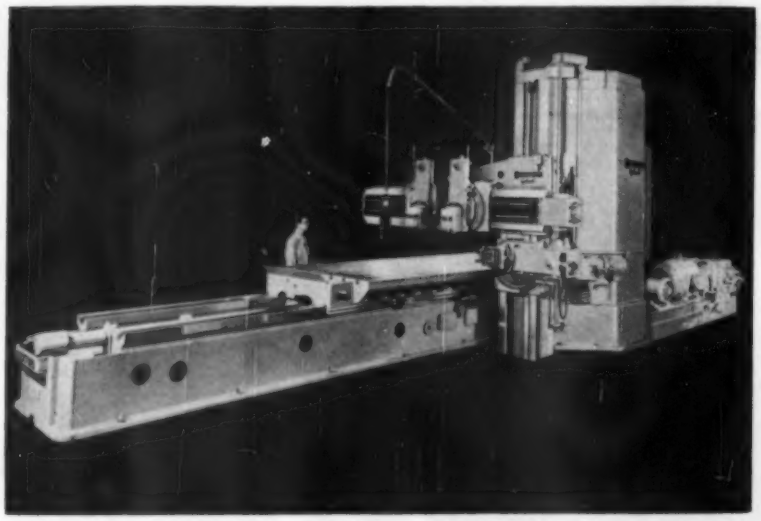
Solder 156
Portable Pipe Rotators 156

INSPECTION AND LAYOUT

Torque Wrench Calibrator 146
Contour Projector 148
Magnetic Inspection Supplies 158
Magnifier 158

PLANT SERVICE EQUIPMENT

Dust Collector 150
Straddle-Lift Hand Truck 154
Transfer Conveyor 156



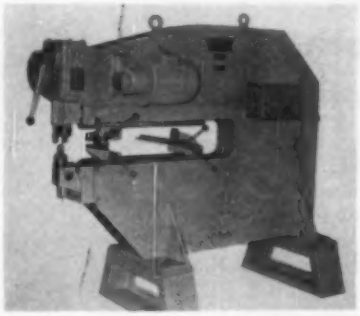
Rockford Heavy-Duty Hydraulic Planer Combines Rigidity with Accuracy

Designed to meet the demands of the most modern cutting tools and techniques, heavy-duty planer trademarked Hy-Draulic has such features as power rapid traverse, power rail elevation, automatic power rail lock, and automatic way lubrication. Unit reportedly has extremely heavy column, crossrail, and head construction. A one-piece, L-shaped rail construction is designed to assure continued accuracy during machine life.

Planer is available in 60 x 60-in. size and above, and may be had with conventional single circuit or with company's recently developed "h3" triple circuit. On both machines all movements of the heads are controlled from the pendant. On machines with the h3 drive, complete table control (including speed adjustment with a direct-reading speed indicator) is also obtained from the pendant.

Unit is equipped with company's "Tool-trol" feature, an integral part of the head control that permits manual inching, in either vertical and horizontal directions, of either head—from either end of the rail or from the head itself. Another design feature is the use of two-speed traverse motors: maximum speed for rough positioning and slow speed for extremely close power positioning of the heads. Manual movement in setup work reportedly is eliminated in many instances.

Rockford Machine Tool Co, Dept 201, Rockford, Ill

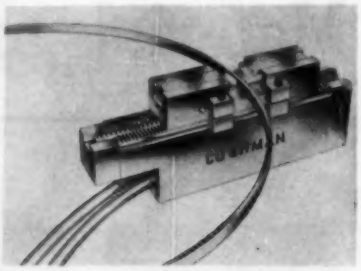


Machine Cuts and Forms Metal and Plastic Sheet or Plate

Universal plate and sheet working machine, Model P-9 has an edge cutting capacity of ⅜ in. in mild-steel plate and ¼ in. in stainless-steel plate. As in other models of these machines the cutting is done by a stationary lower tool and a reciprocating upper tool. New type of stroke length adjustment permits eight different stroke lengths from 0.008 to 0.320 in.

Unit's 5-hp motor operates at two different speeds and can be adjusted to operate at 500, 1000, and 2000 spm. Machine is capable of straight, circle, and irregular shearing operations in addition to slot cutting, beading, joggling, dishing, edge bending, and flanging. Literature available.

American Pullmax Co, Inc, 2455 N Sheffield Ave, Chicago 14, Ill



Chuck Grips Large-Diameter, Small-Cross-Section Workpieces

Automatic Pinch Jaw chuck, for use on vertical or horizontal-spindle machines, is designed for chucking parts of large diameter and small cross-section without strain or distortion while they are being machined. Chuck is comprised of a chuck body with multiple pinch jaw units and three self-centering master jaws. Each pinch jaw and the centering unit containing the master jaws are operated by self-contained reversible air motors.

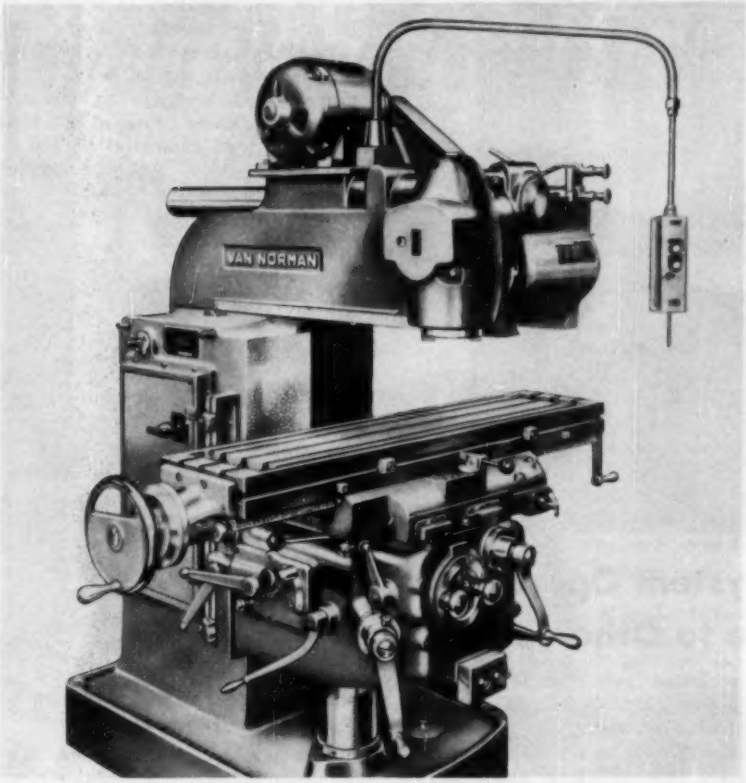
A maximum pinch of over 2000 lb at 85 psi is possible for each pinch jaw unit, with lift of less than 0.002 in. per jaw.

Cushman Chuck Co, 806 Windsor St, Hartford, Conn

Universal Work Positioner Handles Small Assembly Work

Fixture called Veep PowRarm can be used with vises or special workholding devices to move work to any position in all three planes. At end of shank there is a ½-in.-dia female socket, equipped with a socket head setscrew. Force is applied by an eccentric on main shaft. Steel body is cadmium plated to prevent corrosion. Unit will support 15 lb at 6 in. Dimensions are 4 x 2¾ x 3¾ in. high; unit weighs about 3 lb and sells for less than $10.

Wilton Tool Mfg Co, Inc, Schiller Park, Ill



Van Norman Ram-Type Milling Machines Have Adjustable Heads

Model 24LA ram-type milling machine features 9 speeds, ranging from 50 to 1400 rpm. Horizontal distance from centerline of spindle to table is 21 in. max, 1 in. min; vertical distance is 15½ in. max. Vertical distance from spindle to column is 22 in.; vertical distance from centerline of table to column is 18¼ in. max, 6¼ in. min. Cross travel is 12 in.; longitudinal, 28 in.; vertical 20 in. Table measures 50 x 10½ in.

Two other machines are also available: Models 24MA, with 12 speeds from 40 to 1600 rpm, and a max vertical distance of 18½ in. from centerline of spindle to the table; and Model 24MLA, with 9 speeds from 50 to 1400 rpm, and a max vertical distance of 22 in. from spindle to table.

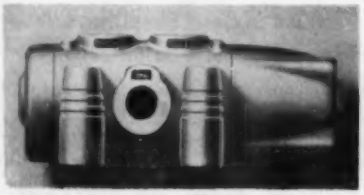
Van Norman Machine Co, Springfield, Mass

Improved Abrasive Developed For Toolroom Grinding Wheels

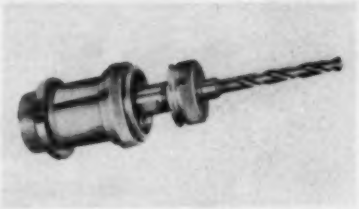
Friable aluminum oxide abrasive grain used in the manufacture of SA Borolon grinding wheels is produced in single crystal form without crushing. Each abrasive particle is said to contain multiple cutting edges over entire surface, permitting greater penetration into the work, and faster grinding.

New abrasive is reportedly proving especially efficient for use in vitrified bonded grinding wheels for precision work, such as surface grinding, and tool and cutter grinding. Details in bulletin Form ESA-272.

Simonds Abrasive Co, Tacony & Fraley Sts, Philadelphia 37, Penna



HYDRAULIC 4-WAY VALVE, oil-pressure-operated Model 5835 for 1500-psi pressure, is available in sizes ¼, ⅜, ½, ¾, 1, 1¼, 1½ in. Catalog 204—*Rivett, Inc, Brighton 35, Boston, Mass*

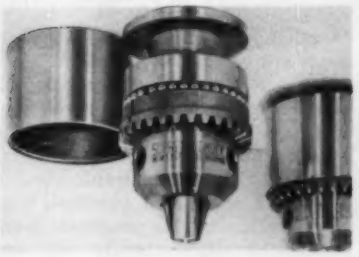


Quick-Change Preset Tools Slash Downtime on Automatics

New line of quick-change tools, designed for holding end-cutting tools on automatic screw machines, offers several outstanding advantages: sharply reduced downtime with quick-change tools; preset tooling that guarantees accurate reproduction of parts and eliminates in-the-machine adjustments; and operation of the machine at the optimum cutting speed.

Devices are available in front-removal (illustrated) or rear-removal types to accommodate widest possible range of tools and installations.

Scully-Jones & Co, 1916 S Rockwell St, Chicago 6, Ill



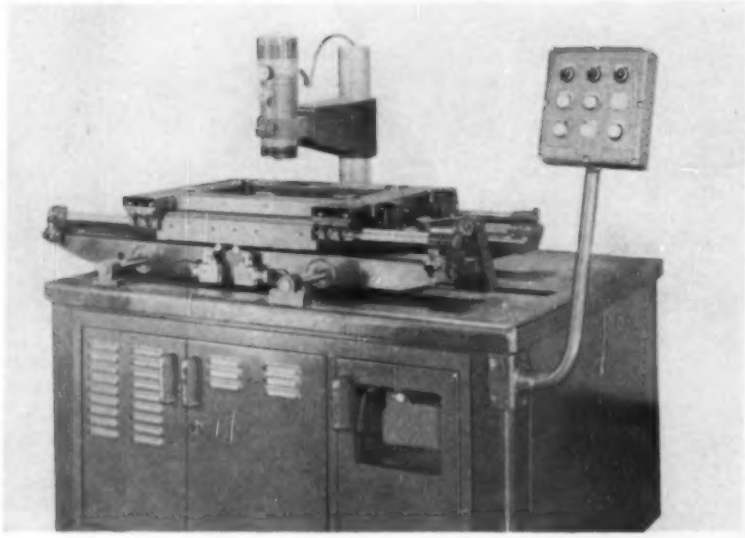
Ball-Bearing Chucks Feature Greater Gripping Force

Series 20 ball-bearing geared chucks reportedly grip with much greater force than any plain bearing chuck. Ball races are formed directly in the hardened chuck body and in the one-piece gear nut. Sleeve, which covers unit, is free from protrusions on which operator could snag clothing or other materials. Catalog 274.

Supreme Products Corp, 2222 S Calumet Ave, Chicago 16, Ill

Spin-Lock nuts, which combine the function of nut and lock washer in one piece, are available in sizes from No. 8 to ½ in. Ratchet-like structure on base of fastener bites into bearing surface of the metal to be joined, resisting any tendency to loosen.

Russell, Burdsall & Ward Bolt and Nut Co, Port Chester, NY



Numerical Control System Operates Drillpress, Adaptable to Other Units

New type of numerical control called Digital Positioning, shown here applied to a drillpress, uses digital techniques throughout, both in the straight-through portion and in the feedback loop. The electronic components are readily adaptable to other machines in which the positioning of the work or tool to a given spot is desired. These include automatic welders, punches, and stampers. Instructions to the electronic components are read from punched tape.

In this particular machine, work is moved automatically to any square on a 1/64-in. grid within an area of 8 x 16 in. Holes are drilled at rate of one per sec. System could be adapted to such modifications as a turret head or a decimal grid of less than 0.001 in. All dimensions are read from a given reference point, not from one cut to the next; accumulated errors are avoided. Other advantages claimed are higher accuracy and greater service economy from the electronic portion of the tools, since digital techniques do not require balanced precision parts.

Laboratory for Electronics, Inc, 75 Pitts St, Boston 14, Mass

Standard Machine Bases Save Both Engineering and Fabricating Time

Standard machine bases, which come knocked-down, are made of steel plate ranging from 3/16 to 5/16 in. thick. Parts are so designed that any size of base from 24 to 48 in. long or wide and from 24 to 54 in. high may be quickly assembled; parts are drilled so that they may be bolted together for welding. Units are available as stock items and have high salvage value because they can be used over and over again by simply making changes in tooling.

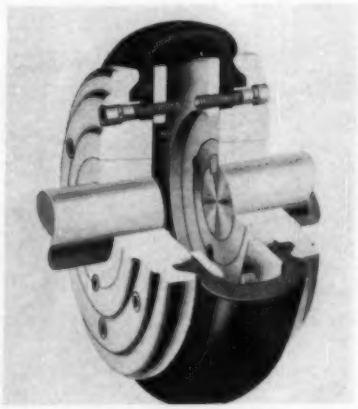
Inter-Lakes Engineering Co, 39200 Groesbeck Highway, Mt Clemens, Mich

Machine Fixture Simplifies Compound-Angle Setup Problems

Combination instrument and machine fixture called the Derry Triangulator reportedly solves the time-consuming compound-angle setup problem. Device consists of two 360° protractors set at 90° to each other with sturdy mounting plates on top and bottom. By use of quick release clutches any compound angle on a spherical arc can be quickly set, locked, and adjusted to within one minute of arc accuracy.

Common axis center-of-gravity rotation prevents sag or sway by reducing load leverage to absolute minimum. Device comes in two sizes with 90° load capacities of 150 or 300 lb.

Oviatt Engineering & Mfg Co, Sun Valley, Calif



Rubber Tire Flexible Coupling Features Four-Way Flexing

Flexible coupling, designated Paraflex, can handle angular mis-alignment, parallel mis-alignment, and end-float, or any combination of these factors. Flexible member also cushions shock loads and diminishes torsional vibration, thus protecting both the driver and the driven member of power transmission machinery. Coupling consists of flexible tire clamped between two hubs which are mounted on the shafts to be coupled. Tire is held between the flanges and clamp rings of the hubs. Both hubs are machined to take Taper-Lock bushings. These give the equivalent of a shrink fit on the shaft and permit easy application to shafts of different diameters without reboring.

Unit will take angular mis-alignment up to 4°, parallel mis-alignment up to ⅛ in., and end-float up to 5/16 in.

Dodge Mfg Corp, Mishawaka, Ind

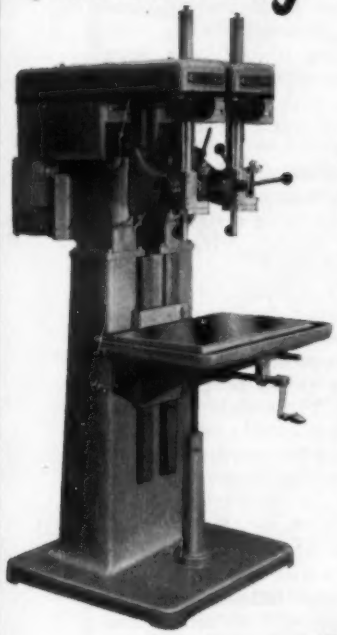
Oil base additives, Cimcut AA (general purpose), NC (non-corrosive, for non-ferrous metals), and SS (heavy-duty, for ferrous metals), are added to mineral oils to form cutting oils. Materials are mixed with mineral oils in proportions varying from 1 to 20%, and can be obtained in the concentrated form or pre-blended.

Cincinnati Milling Machine Co, Cincinnati 9, Ohio

EDLUND

"F" SERIES

Infinitely Variable Speeds



Edlund Model 1F

Sensitive machine for small parts and components.

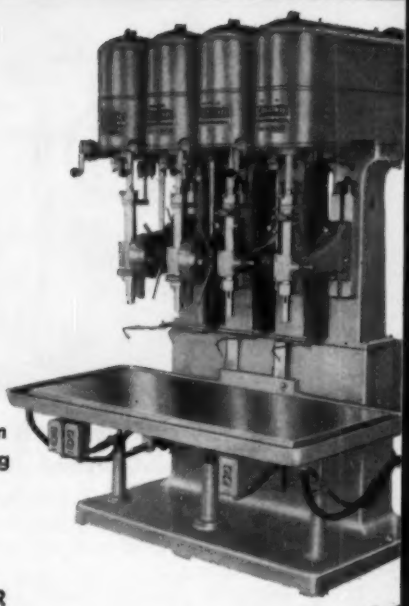
Infinite selection of speeds to 10,000 rpm

7" & 10" Overhang

⅜" Capacity

Pedestal and Bench models

Write for Bulletin 160



Edlund Model 2F

A top production machine for medium to heavy drilling and tapping.

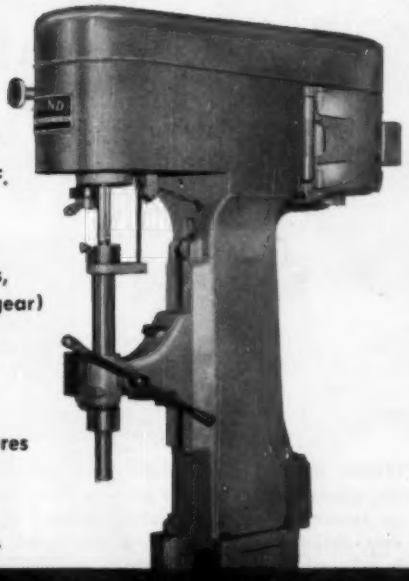
Infinite selection of speeds to 3,600 rpm
8"–12"–15" Overhang
1¼" Capacity

Pedestal and Round Column types

Write for Bulletin 140R

America's Most Versatile Drilling Machines

Introducing.... Edlund Model 2FV



Continuous Production Drives for the Model 2F.

If your production requires only one or five pre-selected speeds, (two or ten with back gear) then the 2FV Single or Five-Step Drive will reduce your original machine cost.
All other machine features are identical with the Model 2F.

Write for Bulletin 140V.

Edlund Model 4F

A work-horse production machine for heavy duty drilling and tapping operations.

1¾" capacity with infinite selection of speeds to 2200 rpm
12" Overhang

Pedestal or Round Column Types

Write for Bulletin 170 R

EDLUND
MACHINERY COMPANY
Cortland, New York
Division of Harsco Corporation

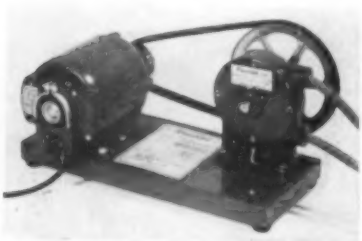
EDLUND Representatives in Major Cities

Torque Wrench Calibrator Is Completely Self-Contained

Hydraulic torque wrench calibrator is capable of testing torque wrenches to within 1% of accuracy of full scale reading.

Operator puts wrench in a coupling and turns it, creating a hydraulic pressure within the unit. Gage reads directly in torque units. Three sizes are available, each size having an option of two torque range readings. Smallest unit, weighing 7 lb, has torque readings of 0 to 200 in.-oz, or 0 to 200 in.-lb. Second calibrator, weighing 14 lb, makes measurements in ranges from 0 to 60 ft-lb, or 0 to 150 ft-lb. Largest instrument, weighing 65 lb, measures from 0 to 600 ft-lb, or 0 to 2000 ft-lb. Calibrators are packaged in wooden carrying case.

Skidmore-Wilhelm Mfg Co, 442 S Green Rd, Cleveland 21, Ohio

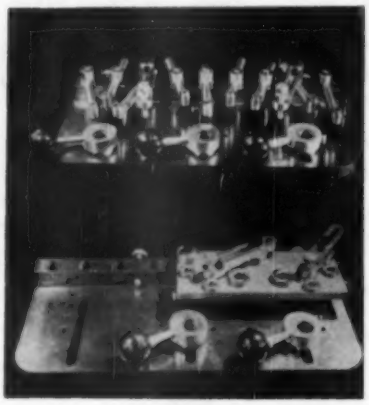


Pump Handles All Types of Abrasive Solutions and Slurries

New pump, designed to handle abrasive solutions and slurries, features reduced maintenance because no part of pump is wetted by fluid. One continuous flexible tube forms both inlet and outlet. It passes through body of pump where it is exposed to the action of a rotary squeegee. Selection of a tubing material to suit the solutions being handled makes it possible for pump to operate free of corrosion, contamination, and wear from abrasive particles.

Unit is recommended for pumping cutting and cooling fluids where abrasive particles of a size not easily held by a strainer are present.

Randolph Co, 1018 Rosine St, Houston, Texas



Adjustable Drilling Jigs Speed Short-Run Production

Jable (British) adjustable drilling jig system eliminates the need for individual jigs in drilling holes to close limits in flats, profiled shapes, and angles. This is accomplished by clamping the bushings to a templet, drilling holes 3/16-in. dia, and then opening out to the required size. Jig permits up to 9 holes to be drilled at one setting. Additional holes may then be located by passing the part through the jig with another setting. Holes have been reproduced to ±0.002 in. in batches of 50 or more, with a templet-making time of 15 min, and a jig set-up time of 4 min.

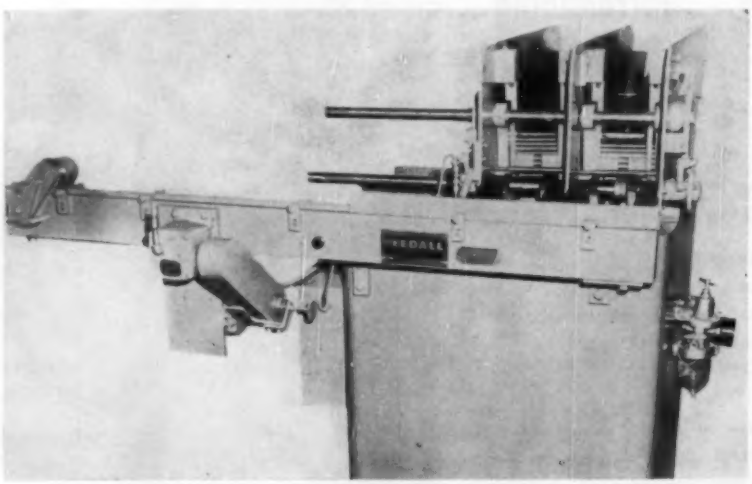
Although originally designed for short runs, system can be adapted to longer runs by using a rigidly fixed plate (lower photo), drilled to desired hole pattern.

Clamping is effected by eccentric clamps, mounted in T-slots, which press the work against hardened, adjustable stops protruding horizontally through a raised portion of the base casting. These clamp the arms containing the 3/16-in. drill bushings. Units can be converted to light milling or tapping fixtures.

Distributed by Wharton and Wilcocks of America, Inc, 17 Battery Pl, New York 4, NY

Threadless pipe fittings have been developed that will withstand traction forces up to 3600 lb, and hydrostatic pressures from 450 psi on 2-in. pipe to 5000 psi on ½-in. pipe. They are available in couplings, adapters, 90° elbows, and tees.

Telsco Fittings Division, 5428 Redfield St, Dallas, Texas



BAR FEEDER, Model 1700-B, using dual automatic feed, handles two production parts simultaneously, operates at 50 pieces per min. Two feed chutes selectively arrange parts on external feed track, orienting them to flow into production machine at any desired speed. Track is equipped with automatic cycling controls. Unit is adjustable to handle parts of various lengths, and can be adapted to feed wide range of parts in continuous flow—*Feedall, Inc, 38399 Pelton Rd, Willoughby, Ohio*

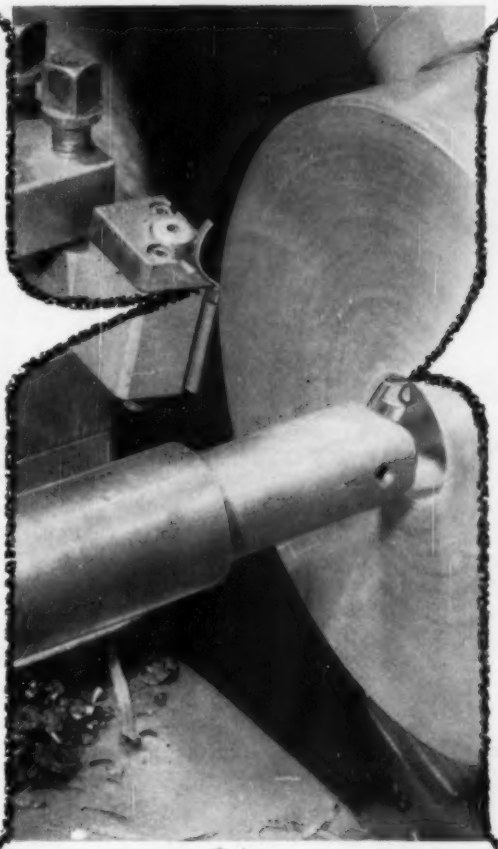
How V-R Tooling can reduce costs on your Turret Lathe Operations

High Speed Turning with New VR-75 Cemented Carbide

Surface speed dictates the choice of cutting tool material. When surface speeds are high enough to use cemented carbides, selection of a carbide grade depends upon the type of material being machined, and the amount of heat, shock and/or abrasion encountered.

Example: Turning an 8" O.D. on Arma-steel at 450 SFPM (215 RPM) with a V-R toolholder and VR-75 carbide throw-away insert. The high edge strength and high heat resistance of VR-75 carbide provides longer tool life and less downtime on this job. VR-75 is outperforming all other carbides on a wide range of steel machining applications.

Your V-R Representative or Distributor offers you a complete line of V-R quality carbides to best meet your requirements. Factory trained service engineers back the V-R line with a complete carbide engineering service. Call locally or write V-R today.

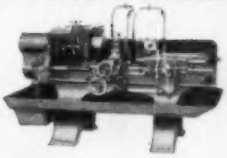


Medium Speed Boring with Tantung, V-R's Exclusive Cast Alloy

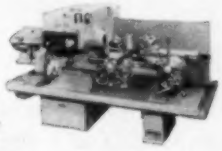
When surface speeds are too low for economical use of cemented carbides, and too high to permit use of High Speed Steel, V-R Tantung is the answer. This *exclusive V-R cast alloy bridges the gap between the maximum speeds possible with High Speed Steel, and the minimum speeds practical with cemented carbides.*

Example: Boring 2⅛" I.D. in Arma-steel while simultaneously turning the 8" O.D. as shown. The 215 RPM produces a 150 SFPM speed on the boring operation. This is too fast for High Speed Steel, too slow for carbide. Tantung gives maximum tool life with minimum downtime.

Your V-R Representative or Distributor is equipped to provide you complete information about the characteristics and applications of V-R Tantung Cast Alloy. Call him or write V-R.

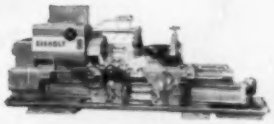


BARDONS & OLIVER



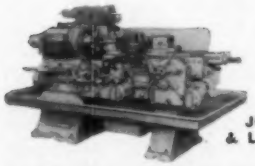
WARNER & SWASEY

POTTER & JOHNSTON



GISHOLT

SOUTH BEND



JONES & LAMSON

V-R, manufacturer of both cemented carbides and Tantung cast alloy, offers you the cutting tool material best suited to your requirements. SEND FOR CATALOGS—and ask about VR-95 Ceramic for ultra high speed machining.

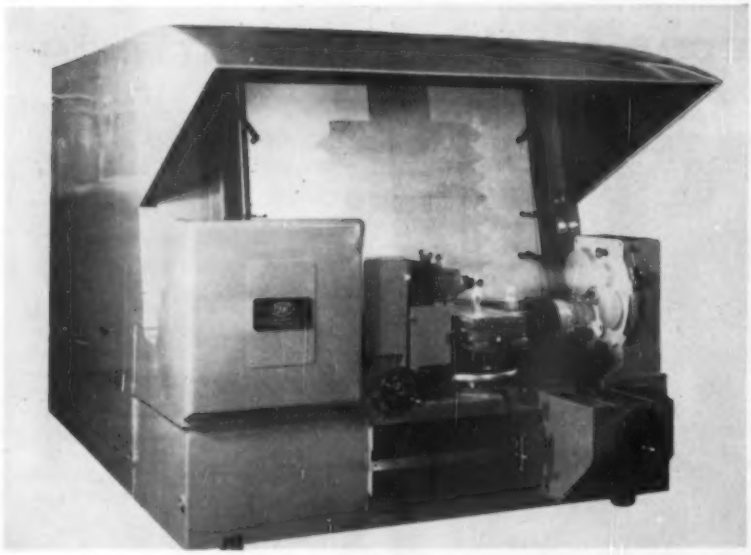
MANUFACTURERS OF:
CEMENTED CARBIDES, TOOLHOLDERS and TANTUNG® CAST ALLOY CUTTING TOOLS

Vascoloy-Ramet Corporation

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

870 Market Street • Waukegan, Illinois

CT-628



British Contour Projector Provides Magnifications up to 100X

Model WP 100 universal projector, a product of Optical Measuring Tools Ltd, Maidenhead, England, is designed for the inspection of contours such as templets, gears, cam forms, broached parts, and screw threads, and for the visual finishing of profile gages while actually projected on the screen.

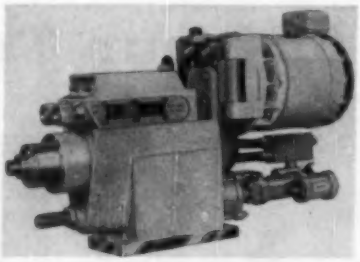
In its basic form the projector is supplied with a 20 x 10-in. rectangular table with T-slots for the attachment of fixtures, and an elevating mechanism. Four lenses mounted on a single turret give a 6-in. field of view at 10X magnification with correspondingly reduced fields at 20, 50, and 100X. Lens turret has both vertical and lateral adjustment. Illumination for both diascopic and episcopic projection is provided by 250-v, 1000-w high-pressure mercury-vapor lamp cooled by a forced draft system. The 60 x 40-in. clear glass projection screen is tilted back for ease of viewing.

Auxiliary equipment includes a precision table, the top section of which has a 6-in. movement at right angles to the optical axis; lower section provides a ±1-in. focusing movement. Complete assembly can be rotated through 12° on either side of zero setting to compensate for helix when inspecting screw threads and hobs. A vertical glass workplate is available for profile projection of flat-form work such as punch products, cams, and small gears. Knee bracket, designed for support of fixtures or large-dia workpieces, has vertical movement and can be traversed across front of projector. It is mounted on a dovetail slide on front of machine. Another valuable accessory is set of centers which accommodate work up to 10 in. in dia or length (*AM*—May 20 '57, p185).

Over-all dimensions of the machine are 6 ft 11 in. high, 6 ft 5 in. wide, 11 ft 8 in. long (over screen hood), and 12 ft 4 in. long over knee bracket. Total weight is 9520 lb.

Distributed by Bentley Trading Co, 41 E 42 St, New York 17, NY

SURFACE GRINDER, called the Challenger, has a capacity of 6 x 18 in., and is guaranteed within 0.0002 in. for flatness and parallelism. Cost is only $1395—Boyar-Schultz, 2000 South 25th Ave, Broadview, Ill



Bellows Adds Heavy-Duty Drill Unit To Controlled-Air-Power Line

Carbi-Drill is a complete production unit for high-speed drilling, reaming, counterboring, precision boring, and spot facing; tapping may be done by addition of a tapping head. The 225-lb device, with standard 2-hp electric motor, can be mounted in any position. Thirty-five spindle speeds from approximately 600 to 6000 rpm are available by changing timing belt and motor pulley.

Adjustable air-powered advance to the work, controlled hydraulic feed of the spindle, and adjustable air-powered rapid return are accomplished with a Bellows air motor and Hydro-Check inline power unit built into the base. Model BEM-10 air motor supplies a power thrust to the quill of the drill unit of 10 times applied airline pressure.

Amount of rapid advance and depth of feed are both electrically controlled, adjusted by two external calibrated knobs. Unit has a fully adjustable stroke length from 1½ to 4 in. with optional stops available for 0 to 4 in. for either the rapid advance or hydraulic feed portion of the stroke. Drilling capacity is up to ⅝-in.-dia drill in mild steel.

Bellows Co, Akron, Ohio

Rotating Protractor Screen Has Vernier Reading to 1 Min of Arc

Rotating protractor screen, No. 70, is designed to fit the 14-in. Portman optical comparator. Device gives full screen coverage and rotates a full 360°. Screen is graduated from 0 to 180° in 30′ intervals in both directions from zero point. The vernier plate enables operator to read to 1′ of arc. A rotation control knob is attached to the stationary outer ring which fits into the screen recess of the comparator.

The rotating protractor screen and holder, 14½ in. in dia, is priced at $150. Other sizes available. Bulletin 1 available.

Walter H Glardon Co, 68 Oak St, New Rochelle, NY

A new dimension in motors!

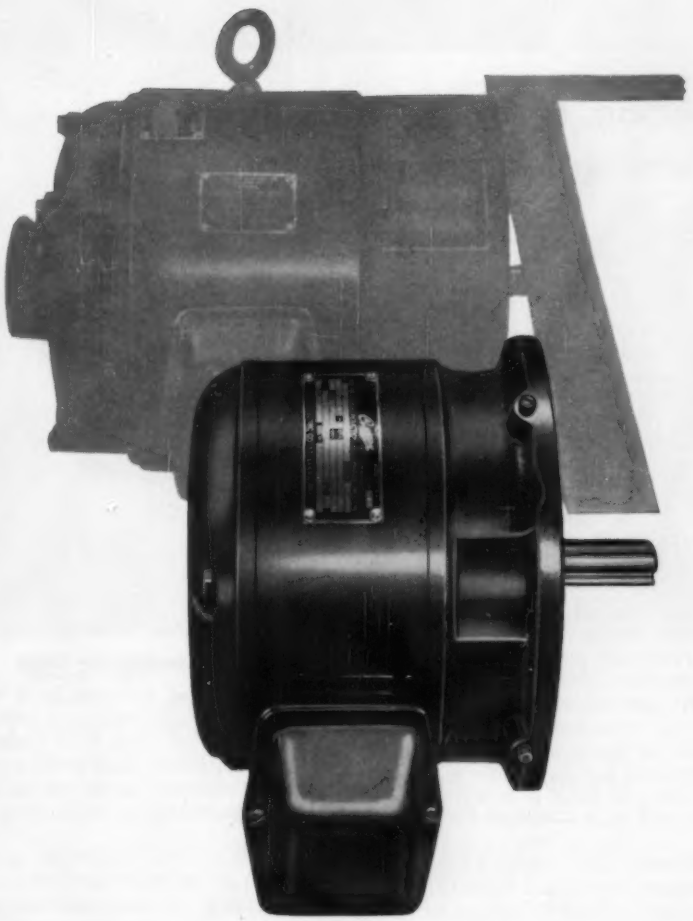
SHORTER Century **Performance Rated© MOTORS**

SAVE SPACE...
SAVE WEIGHT

This new line of shorter, round-frame, end-mounted motors by Century can give you greater freedom in design and engineering. They meet modern demands for compactness and weight-saving ... with even better performance.

No special mountings are required! These shorter Century motors have full-size NEMA "D" flanges. They are interchangeable with all other popular makes of standard end-mounted motors. The shorter motors are available in sizes from 1 to 15 H.P... in open or totally enclosed fan-cooled frames . . . for vertical or horizontal applications.

For full data, call your nearest Century Sales Office.

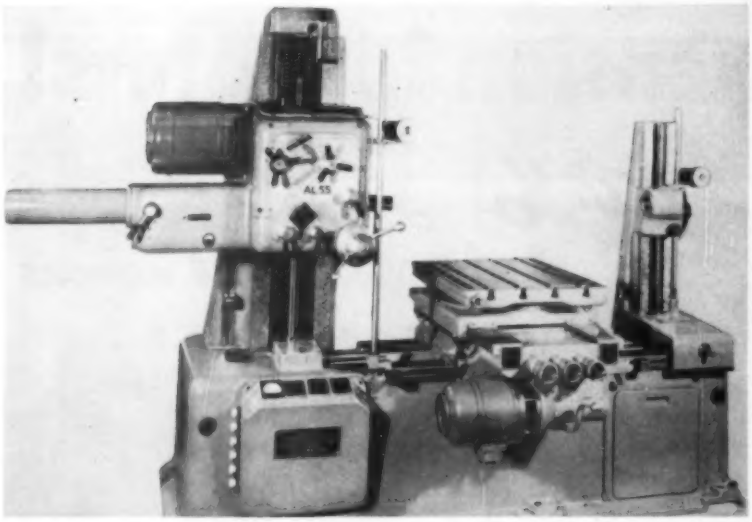


Performance Rated©
MOTORS
⅛ to 400 H. P.

CENTURY ELECTRIC COMPANY

1806 PINE ST., ST. LOUIS 3, MO. • *Offices and Stock Points in Principal Cities*

34



Boring, Drilling, Milling, and Turning Machine Has Rotary Table

New 2-in. Supermill Model AL55 (Italian) can be used for boring, drilling, milling, and turning, and is capable of direct readings to 0.0001 in. It features a built-in rotary table, 28 x 22 in., which is motor driven, independent of the headstock, with 6 power feeds and rapid traverse in all directions. Capable of 360° rotation, table can be speedily indexed every 90° by built-in stops.

Disk clutch between motor and gears drives the 12-speed spindle, which is stopped by an electric brake. Distance from spindle sleeve to outboard support is 45 in. Forced-feed lubrication system thoroughly lubricates all gears and splined shafts; single-shot lubrication takes care of ways and slides.

Available with the machine are 180° and 360° vertical heads, facing head, horizontal milling spindle, turning chuck, as well as a full line of boring bars and other tooling.

Imported by S & S Machinery Co, 140 53rd St, Brooklyn 32, NY

Air valve, pilot-operated poppet type, features aluminum construction and in-line cylinder and inlet ports which allow valve to be mounted directly on cylinder. Valve is furnished in ¼, ⅜, ½, ¾, 1, and 1¼-in. sizes, either NO or NC with continuous-duty solenoids. Recessed pin, which can be locked in or out, allows manual operation of valve without removing cover.

Automatic Valve Co, 37415 Grand River Ave, Farmington, Mich

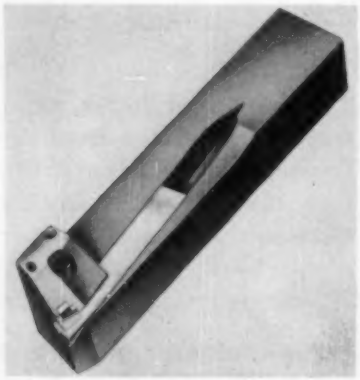
Dust Collector is 1/10 to 1/20 The Size of Comparable Units

Microdyne dust collector is a wet, inertial-type unit which is 1/10 to 1/20 the size of units with comparable capacity. Test figures show unit to have efficiency of 99+% in collecting particles of 5 microns or greater.

Microdyne is a cylindrical device having two essential parts—a mixer section and an eliminator section. Dust-laden air enters at mixer section. Each particle is enveloped in water as it passes through a fine spray. The air and entrained, water-enveloped dust pass through turning vanes as they enter eliminator section. These vanes impart helical motion which causes a centrifugal force that separates entrained particles from the air. Dust-laden water is captured at periphery of section in blind louvres connected to a disposal sump. Cleaned air passes out through straightening vanes which recover energy of rotation thus reducing over-all draft loss. A third section, containing an axial flow fan, may be added.

Commercially available units range from 2500-cfm model (15-in. dia, 90 in. long, without fan) to 48,000-cfm model (53-in. dia, 220¼ in. long, without fan).

Joy Mfg Co, Henry W Oliver Bldg, Pittsburgh 22, Penna



Carbide-Turning Toolholder Produces Positive Rake

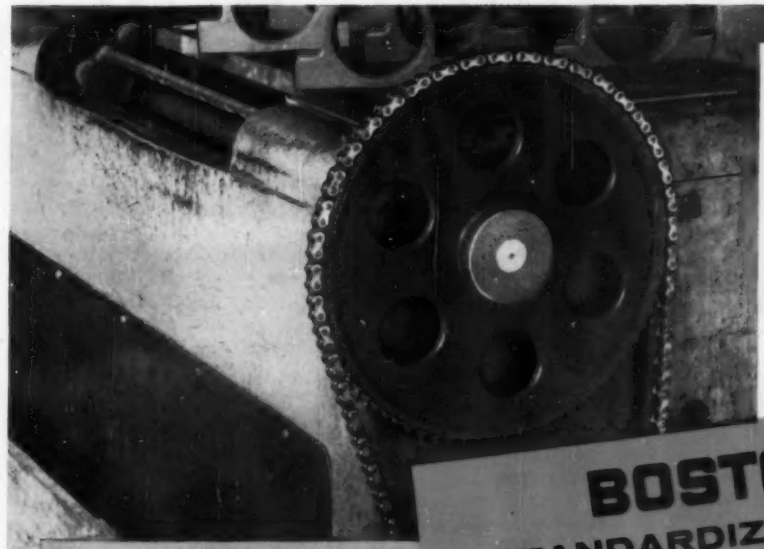
Holder incorporates a solid carbide triangular toolbit for positive rake turning, permitting greater depths of cut with decreased tool pressures, and up to 30% hp reduction over negative rake tools, according to manufacturer. Positive chip control is achieved with the newly developed Everede solid carbide chipbreaker, infinitely adjustable to accommodate any combination of feeds and depths of cut.

Additional features: up to 2-in. reduction on diameter in one pass; any nose radius to suit machining requirements and optimum finish; reduction of tool inventory by 50% with lead angle or straight-to-shoulder cutting in one tool.

Everede Tool Co, 2000 N Parkside Ave, Chicago 39, Ill

Tapping oil, Habcool 318, contains anti-weld ingredients blended and energized to withstand extreme pressures developed when tapping and thread chasing tough alloy steels. Product is applied in small quantities by brush to tap or chaser.

H & B Petroleum Co, 799 E 25th St, Paterson 4, NJ



NOW!

CONSTANT TORQUE VARIABLE SPEED

units to match the high performance standards of BOSTON Gear SPEED REDUCERS

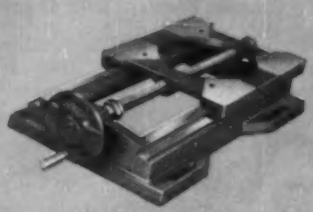
BOSTON Gear STANDARDIZED STOCK VARIABLE SPEED DRIVES

BOSTON VARIABLE SPEED DRIVES

Assembly consists of a self-contained, spring-tension Motor Pulley, a Flat Face Driven Pulley, a heavy duty Belt, and an Adjustable Motor Base. The self-contained design of the Motor Pulley provides a patented safety-lock feature which prevents accidental release of the spring when the disc assembly is removed.

BOSTON VARIABLE SPEED REDUCTOR DRIVES

Consists of above described parts with addition of a BOSTON 100 Series Reductor, — Type U, TW, V, or VW. Illustration (right) shows Variable Speed assembly with Type TW Reductor, used with BOSTON Sprockets and Chain to drive conveyor belt of heat-treating furnace.



ADJUSTABLE MOTOR BASE

A ruggedly proportioned sliding platform, with accurately machined dovetail ways, lead screw, and nut for positive control and vibrationless, noise-free operation. Sold separately, this base is also widely used for many other applications requiring an adjustable motor mounting.

Designed for use with ½ and ¾ HP motors, to provide infinitely variable, 3 to 1 speeds. Speed changes can be made while the drive is running. Output torque ratings remain constant throughout the speed variations. Any driven shaft speed range needed, between 1750 RPM and .5 RPM, can be provided with the use of STANDARDIZED STOCK parts.

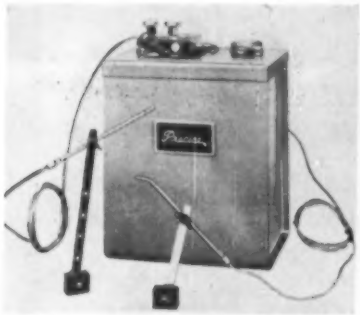
Ask your BOSTON Gear Distributor for complete information and a demonstration at your plant. Boston Gear Works, 60 Hayward St., Quincy 71, Mass.

7124 POWER TRANSMISSION PRODUCTS FROM STOCK

CALL YOUR BOSTON Gear DISTRIBUTOR

For nearest Distributor LOOK UNDER "GEARS" in the 'Yellow Pages'

STOCK GEARS • SPROCKETS and CHAIN • SPEED REDUCERS • BEARINGS • COUPLINGS

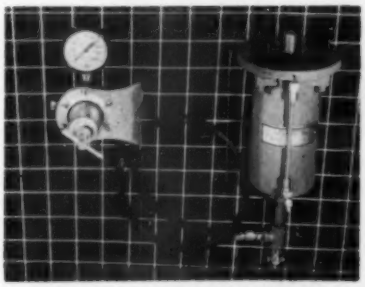


Cooling and Lubricating System Uses Diffused Liquid Vapor

Vapor Lub system is designed for use with high-speed spindles using grinding wheels or carbide cutters, but is also effective on conventional milling machines, drillpresses, or tapping operations. Unit creates a blast of vapor at the cutting region. Two separate lines are used—a coolant line and an air line. At the point of work these lines create a liquid vapor that is many degrees cooler than ambient temperature, permitting more effective cooling and lubrication of the work and tool.

Unit is equipped with a 2-gal tank. Adjustable magnetic holders are used to mount the nozzles. A Vapor Lub concentrate, specially developed for this system, is also available.

Precise Products Corp, Racine, Wis



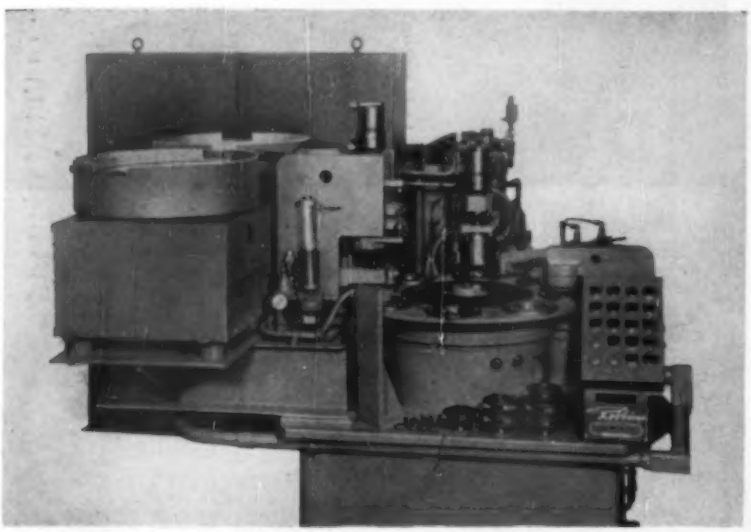
PNEUMATIC DIE CUSHION, Model RD, is easily attached to any inclinable press within its capacity. Improved unit requires the drilling and tapping of only one hole, either in the bolster plate or die shoe, for installation. Device is made in six sizes, from 2 to 6 in., with draw-ring holding pressure from 400 lb to 1 ton—*Dayton Rogers Mfg Co, Minneapolis 7, Minn*

Steel Bolts Have High Temperature Resistance up to 900 F

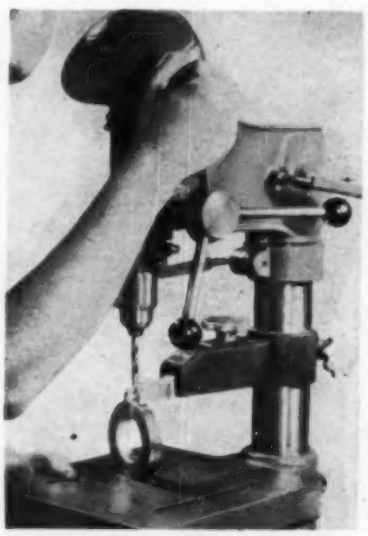
Hi Tm 9 fasteners, at 900 F, have a minimum tensile strength of 170,000 psi—50% more than the strength of stainless and alloy-steel fasteners currently used at this temperature. These bolts are said to be as strong at 900 F as most present-day high-strength fasteners are at room temperature. The first fasteners produced, designated EWB Tm9, are 12-point external wrenching type used in airframe tensioning. They are made from VascoJet 1000, a 5% chromium hot-work die steel produced by Vanadium-Alloys Steel Co, Latrobe, Penna.

Initial room temperature tensile strength of 220,000 psi drops to a minimum of 170,000 at 900 F. Room temperature shear strength of 140,000 psi drops to only 100,000 at 900 F. Company points out several items that contribute to strength of new bolts: new thread design with larger radius in root of thread to reduce stress concentrations; diffused nickel-cadmium plating provides good corrosion and oxidation resistance up to 1000 F; special nut which permits full utilization of bolt strength.

Standard Pressed Steel Co, Jenkintown, Penna



TRANSMISSION GEAR ASSEMBLIES are assembled and checked on 8-station machine. Previously assembled with dummy pins, the gear assemblies are manually loaded into machine. At first station permanent pins are inserted; second station checks press fit of pins; rejects are sorted out at next station; final operation is staking of pins on the acceptable pieces. Machine turns out 720 assemblies per hr at 100% efficiency. Bulletin available—*Omer E Robbins Co, 24800 Plymouth Rd, Detroit 39, Mich*

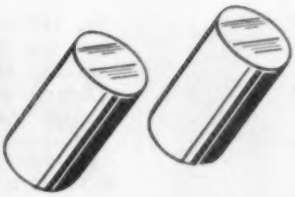


Sta-Put Drillpress Clamp Attaches To Column, Reduces Drill Breakage

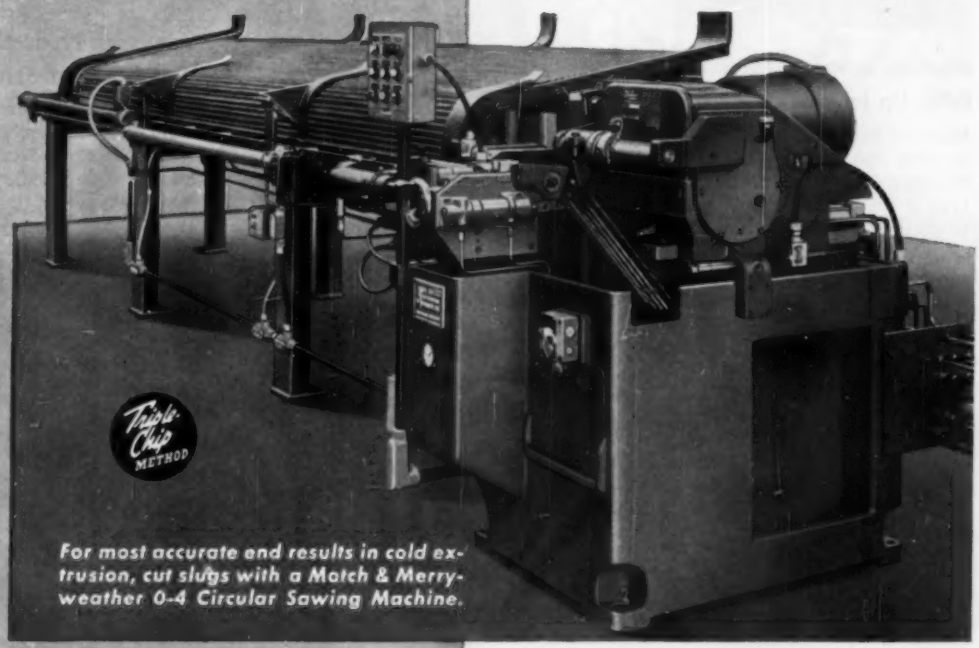
Sta-Put clamp has a split collar and attaches to drillpress column. It can be adjusted to hold almost any shaped workpiece securely and accurately. Reportedly it reduces drill breakage, and often eliminates the need for C-clamps, vise, or V-blocks. Device is made of aluminum alloy. Pressure fork which holds the object in place may be extended 1 in. from minimum setting. Slight turn of adjusting knob lowers fork to proper tension. For production work, a toggle handle can replace the knob to provide rapid clamping and releasing action.

Termite Drills, Inc, 99 N Lotus Ave, Pasadena, Calif

cold cuts



BY MOTCH & MERRYWEATHER



For most accurate end results in cold extrusion, cut slugs with a Motch & Merryweather 0-4 Circular Sawing Machine.

. . . make better COLD EXTRUDED PARTS

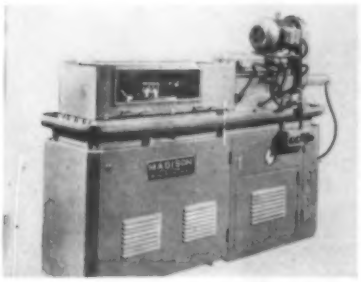
The Motch & Merryweather No. 0-4 Precision Circular Sawing Machine is automatic from the storage table to the finished cut slug. It cuts slugs accurate to ±.002" with uniformly square ends and minimum burr. Give your cold extrusion press the opportunity of producing more work than ever before, with more accuracy than ever before, at a lower cost per piece than ever before.

THE MOTCH & MERRYWEATHER MACHINERY CO.

MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO

Builders of Automatic Precision Cut-Off, Milling and Special Machinery



Machine Accommodates Gun-Type Drills Up to 1 in. in Diameter

Machine features spindle speeds up to 8000 rpm with feeds from 0 to 40 ipm. It will accommodate gun-type drills up to 1 in. in dia. Workpiece is held stationary with the spindle of the self-contained power unit rotating. It has an air-powered, oil-controlled feed with either a 6 or 9-in. stroke.

Base of machine contains a high-pressure coolant system delivering 7.6 gpm, at 750 psi, through the spindle of the machine. System has a 55-gal tank. Over-all dimensions of the unit are 90 x 30 x 63⅞ in., and shipping weight is approx 3000 lb.

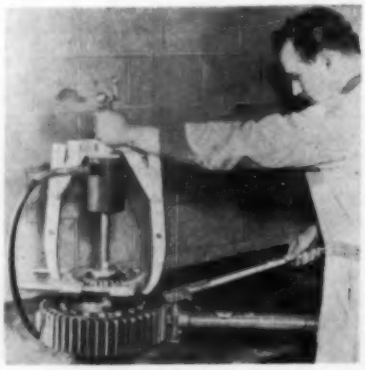
Madison Industries, Muskegon, Mich

Turchan Milling Spindle Offers Wide Range of Speed and Power

Equipped with a specially designed belt arrangement, this new spindle drive offers a wide range of speed and power. Since there are no gears, the unit is quiet and the belts are easily and quickly removed or adjusted to change speed ratios. There are eight spindle speeds from 130 to 2500 rpm. Full horsepower is maintained even on the lowest speeds.

Unit is equipped with a No. 40 National Standard MM taper, has a 2-hp, 1200-rpm, axial air-gap motor, and has over-all dimensions of 29 in. high, 14 in. wide, and 28 in. long. Distance from mounting surface to center line of spindle is 7⅛ in.

Turchan Follower Machine Co, PO Box 6055, Dearborn, Mich



Blackhawk Introduces Line of Hydraulic Rams and Pullers

Holl-O-Ram line of hydraulic rams and industrial pullers consists of three hollow ram models with 20, 30, and 60-ton capacities; a complete set of seven pulling attachments for every shaft pulling operation; three converter sets for conversion of other mechanical and shop-made pullers to Holl-O-Ram use.

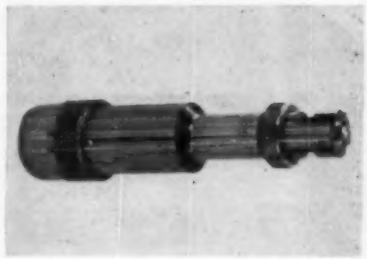
Rams differ basically from standard rams and jacks by having a hollow ram plunger into which smooth, threaded, or serrated plunger saddles can be threaded. Other uses for the units include press-fitting, lifting and pressing, production (with special jigs and fixtures), and pre-stressing.

Blackhawk Mfg Co, 5325 W Rogers St, Milwaukee 46, Wis

Straddle-Lift Hand Truck Has Lifting Capacity of One Ton

Langley Multi-Purpose hand-operated transporter handles skids, pallets, and rolls, as well as machines and reels. Base straddle members adjust to provide inside straddle member clearance of from 33 to 49 in. Forks of Model 30 truck accommodate stringer lengths up to 36 in.; model 42, up to 48 in. Both models will handle pallets up to 48 in. wide. Lift is 14 in.; lowering speeds are variable from 0 to 20 fpm. Bulletin T114.

Langley Mfg Co, Inc, 923 Cambridge St, Cambridge, Mass



Barnesdril Production Honing Tool Uses Hardened-Steel Inserts

Hardened-steel inserts are used to form two sides of this quick-loading honing tool. Inserts reduce wear and allow shop maintenance of tool body. Range of the plate-type tool is from 1½-in.-minimum ID to 5-in.-max ID. Stone lengths are from 3 in. min to 5 in. max.

Barnes Drill Co, 830 Chestnut St, Rockford, Ill

Air-Powered Tool Does High-Speed Grinding, Deburring, Polishing

Model GA-125 high-speed, air-powered grinder has been added to company's line of Controlled-Air-Power work devices. Operating at 100,000 rpm at 80 psi, all the bearing load is carried by air stream, virtually eliminating tool wear. Tool is suited for grinding, deburring, cutting, polishing, die and mold finishing, engraving, and other similar operations. Unit is equipped with filter-lubricator and 6 ft of hose.

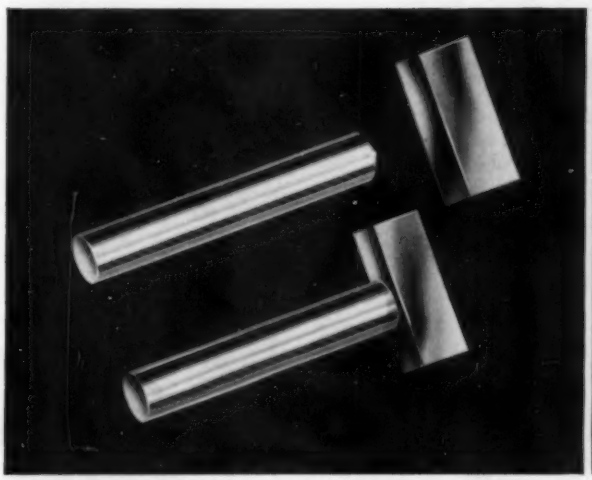
Bellows Co, Box 631, Akron 9, Ohio

Industrial screwdriver, No. 1272, called Thru-Bar, features a hardened and tempered tool-steel bar which extends through a fluted hardwood handle and is winged to prevent turning. Steel cap is pressure fitted over top of the bar. Tools come in eight sizes ranging from 2 to 12 in. long; prices range from $0.45 to $1.15.

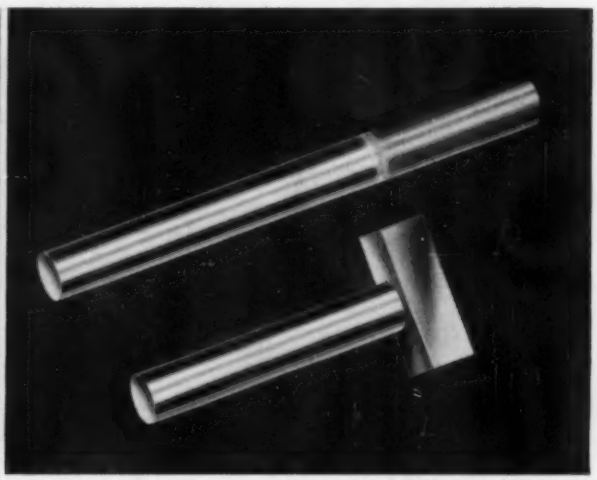
Stanley Tools, Div of Stanley Works, New Britain, Conn

G.R.S. Cuts Costs 65%

with TOCCO* *Induction Heating*



Old Method — headpieces and shanks were butt-welded after shanks were pointed and both parts sandblasted.



New Method — relay cores are formed from barstock heated by TOCCO Induction Heating. No sandblasting or welding is required.

• When General Railway Signal Company converted from butt-welding to TOCCO Induction Heating to form this relay core, they not only produced a better product, faster—but saved money doing it.

Faster Production — A 75 kw, 10,000 cycle TOCCO unit heats 4⅜" of this 9⅞" long, ¾" diameter silicon steel bar to 2100° F. for upsetting magnetic relay cores. 40 kw of high-frequency energy is used, producing 250 pieces per hour—nearly three times the production achieved by their former method.

Lower Cost — Formerly G.R.S. cut separate shanks and rectangular headpieces for this relay core. The shanks had to be pointed and both pieces sandblasted prior to butt-welding. Heating the blanks for forging with TOCCO saves nearly two-thirds the cost of this former method.

TOCCO is Flexible — The part shown is only one of nearly 300 that G.R.S. is heating for forging with TOCCO. Production runs vary from 15 to over 50,000 pieces.

It may pay *you* to investigate TOCCO as a sound method of improving product quality, increasing production and reducing costs.

TOCCO

JUST PUSH A BUTTON

THE OHIO CRANKSHAFT COMPANY

***Mail Coupon Today*— NEW FREE Bulletin**

The Ohio Crankshaft Co. • Dept: B-7, Cleveland 5, Ohio

Please send copy of "Typical Results of TOCCO Induction Heating for Forming and Forging".

Name_____

Position_____

Company_____

Address_____

City_____ Zone____ State_____

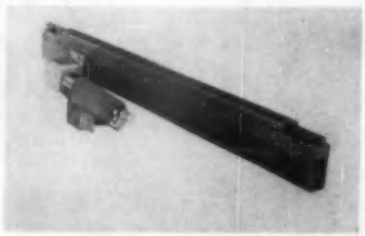
NEW SHOP EQUIPMENT

CONDUIT FITTINGS BRACKET, designated Hub-Lug, fits company's rectangular fittings, and is said to insure moisture-proof, strong mounting of fittings in the electric control and operating systems on machinery. Place device over conduit, attach required fittings, tighten with Allen wrench, secure fittings to machinery through screw or bolt holes in device—*Ideal-Simplet Fittings, Inc, 1057 Park Ave, Sycamore, Ill*

PORTABLE PIPE ROTATORS, Model M-15, consisting of one variable-speed power rotator and one idler rotator, are used for flame cutting and welding operations. Units require no adjustment for pipe sizes from 2 to 24 in. Single pair of rollers has capacity of 1500 lb—*Webb Corp, Reed Equipment Div, Webb City, Mo*

Conversion chart contains conversion data for Rockwell and other hardness tests. Free desk-size chart also has tables for cylindrical corrections.
Torsion Balance Co, Clifton, NJ

Solder, designated Farco All Metal, has been improved to make it more corrosion resistant. Reportedly, solder withstands 20% salt spray bath for 800 hr, has an affinity for all metals including aluminum, and has a melting point only 27 F higher than 50-50. It is soft enough to work with machinist's scraper yet is said to have double the strength of conventional solder. Sample order, 1 lb wire solder for $2, 1 lb flux for $3.50 fob.
Farrelloy Co, 1217 N 26th St, Philadelphia 21, Penna



TRANSFER CONVEYOR speeds movement of cylindrical in-process workpieces between machines. Model 1000 mechanizes the removal and transfer of pieces of ⅛ to 1 9/16-in. diameters between production machines or work stations. Unit includes chain belt conveyor, drive motor, variable speed transmission, and speed controls. Speed of conveyor can be regulated between 5 and 20 fpm—*Production Feeder Corp, 3130 Johnnycake Ridge Rd, Mentor, Ohio*

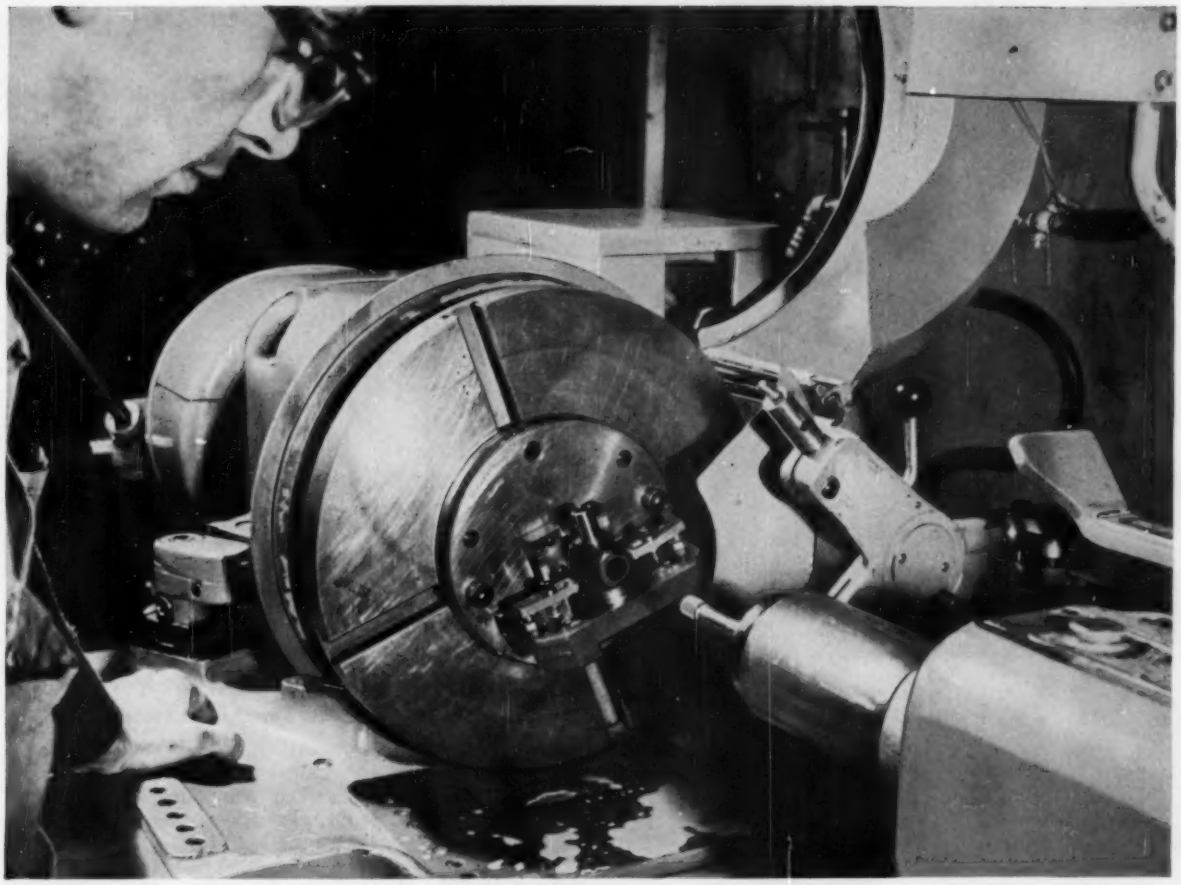
TORQUE RECORDER is designed for checking and recording calibration accuracy in torque wrenches; repetition accuracy in torque wrenches; break-away torque on rotating parts. Deflection of torsional rod is recorded in polar coordinates; several hundred recordings can be made on one sheet if desired—*Swift Tools Inc, Sioux Falls, SD*

Coating compound, dip or brush, said to have excellent adhesion to metals and plastics, is available for manufacturers of electrical components and for application as a resilient coating. Product is prepared from epoxy resin (Epocast 19-B) and a

(Advertisement)

Meet ERNEST F. HENNIS

. . . one of Bryant's internal grinding experts in the New York area. Like other Bryant representatives he knows grinding problems from "A to Z" and likes to solve them.



"Everything they claimed and then some..."

That's Mr. Gerald H. Buchholz talking. He's owner and manager of the Federal Tool and Instrument Company, Corona, New York, and he's talking about his No. 1116 Bryant Internal Grinder.

For more than two years now, Federal has been turning out close-tolerance work with a Bryant Grinder. Mr. Buchholz leaves no doubt as to its value: "It saves us both time and labor, and it holds tolerances better than any similar machine.

"Before our purchase of the 1116 we used an attachment on another machine for our fine work. But it was too slow for our production. We got the Bryant with an eye toward new business — and we got it!

"This machine has been everything the Bryant people claimed and then some. A man can ask no more than that."

See for yourself how a Bryant Internal Grinder can do better grinding *faster*. Ask for an immediate demonstration!

BRYANT Chucking Grinder Co.

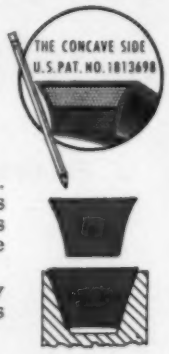
10 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

Internal Grinders • Internal & External Thread Gages • Granite Surface Plates • Magnetic Drums for Computers • Special Machinery

Why *concave sides* insure longer V-Belt life

With one simple test you can demonstrate to yourself why the concave sides (Fig. 1) of the Gates V-Belt insure far longer belt life.



Just feel the sides of a Gates V-Belt on the bend. Note that in bending around the sheave these sides fill out and become straight (Fig. 1-A). That means the belt makes full contact with the sides of the sheave groove; grips the sheave *evenly*.

This even contact distributes wear uniformly across the sides of the belt. Uniform wear lengthens belt life; keeps costs down.

Fig. 2

Fig. 2-A

Now make the same test with a straight-sided belt (Fig. 2) and see what happens. The sides bulge out on the bend (Fig. 2-A) concentrating wear at the points shown by arrows. Uneven wear shortens belt life; increases belt costs.

Cut V-belt replacement costs and down time. Specify belts that grip evenly and wear longer . . . specify Gates Vulco Rope — the V-Belt with concave sides.

The Gates Rubber Company • Denver, Colorado

World's Largest Maker of V-Belts

There are Gates Engineering Offices and Distributor Stocks in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

TPA 150

Gates VULCO ROPE Drives

NEW SHOP EQUIPMENT

special hardener. Pot life is approximately one week; cure takes place at 200 to 250 F. Bulletin EP-57-7.

Furane Plastics, Inc, 4516 Brazil St, Los Angeles 39, Calif

C-Groove Adjustable-Speed Pulley Permits Speed Adjustments of 26%

New drives permit stepless speed adjustment up to 26%, and are recommended when operating in the horsepower range around 15 to 20 hp at speeds from 1160 to 1750 rpm. Each sheave has two C-grooves and is designed for use with company's Super-Service Wedgbelts. Unit is available in three sizes, with pitch diameters of 8.5 to 10.7 PD, 9.5 to 11.7 PD, and 10.5 to 12.7 PD.

American Pulley Co, 4200 Wissahickon Ave, Philadelphia 29, Penna

Illuminated magnifier called Flash-O-Lens, consists of a standard flashlight case and a special illuminating magnifier head. Battery-powered model, 7-power, sells for $14.85; electric plug-in model, also 7-power, sells for $16.85.

Abbeon Supply Co, 179-33D Jamaica Ave, Jamaica 32, NY

Magnetic inspection supplies, for all types of magnetic particle inspection instruments and systems, incude red, yellow, grey, and black powders; red and black paste and fluorescent paste and powder; bulb-type powder dispensers; colored inspection tapes, tags, and dispensers; and a new gun-type powder blower.

Sonoflux, PO Box 14543, Houston 21, Texas

Optical accessory for welding-helmet windows, called Magna-Weld Plate,

720 Assemblies Per Hour AUTOMATICALLY!

This Robbins "Assemblimatic" feeds, positions, assembles and unloads automatically . . . producing 720 four-piece assemblies every hour! It assembles a needle bearing, washer and seal in two sizes of a steering gear end cover. Parts are fed and positioned from indexing magazines, and completed assemblies are removed and placed on a conveyor . . . all automatically.

Machine features include: (1) Robbins panel, one-third standard size, with plug-in aircraft type relays and controls which prevent assembly unless parts are correctly positioned, (2) Index table with both barrel type cam and shot bolt for accuracy and magnetic operation of index and dwell, (3) Positive dwell time control through synchronous timer and electrical interlock at each station, (4) Hardened and ground ways, (5) Automatic lubrication, (6) Electrical and pneumatic equipment to J.I.C.

Robbins special assembly machines save manpower, speed production and improve quality, often combine machining with assembly for further savings. Automatic inspection, selection, orientation, assembly and in-process gaging assure consistent high quality production. Ask us for recommendations to help solve your automatic assembly or machining problem.

OMER E. ROBBINS COMPANY
24794 PLYMOUTH ROAD • DETROIT 39, MICH.

Robbins
SPECIAL MACHINES

New brochure describes and illustrates a variety of Robbins special assembly machines. Write for your copy.

Tool Steel Problems
BETHLEHEM DISTRIBUTOR

the problem, it calls for
nion, and that's where
ehem tool steel distributor
or he's a specialist in tool
s, and it's part of his job
your questions are an-
nptly and courteously.
can also save you time
eed tool steel, for his
tocks are ready to go at
a moment's notice. Make it a point to check with your Bethlehem distributor often. It will take but a few minutes at most, and it's one of the wisest moves you can make.

BETHLEHEM STEEL

BEST
AVAILA

COPY
ABLE

Why *concave sides* insure longer V-Belt life

With one simple test you can demonstrate to yourself why the concave sides (Fig. 1) of the Gates V-Belt insure far longer belt life.

Just feel the sides of a Gates V-Belt on the bend. Note that in bending around the sheave these sides fill out and become straight (Fig. 1-A). That means the belt makes full contact with the sides of the sheave groove; grips the sheave *evenly*.

This even contact distributes wear uniformly across the sides of the belt. Uniform wear lengthens belt life; keeps costs down.

Now make the same test with a straight-sided belt (Fig. 2) and see what happens. The sides bulge out on the bend (Fig. 2-A) concentrating wear at the points shown by arrows. Uneven wear shortens belt life; increases belt costs.

Cut V-belt replacement costs and down time. Specify belts that grip evenly and wear longer . . . specify Gates Vulco Rope — the V-Belt with concave sides.

The Gates Rubber Company • Denver, Colorado

World's Largest Maker of V-Belts

There are Gates Engineering Offices and Distributor Stocks in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

TPA 150

Gates VULCO ROPE Drives

special hardener. Pot life is approximately one week; cure takes place at 200 to 250 F. Bulletin EP-57-7.

Furane Plastics, Inc, 4516 Brazil St, Los Angeles 39, Calif

C-Groove Adjustable-Speed Pulley Permits Speed Adjustments of 26%

New drives permit stepless speed adjustment up to 26%, and are recommended when operating in the horsepower range around 15 to 20 hp at speeds from 1160 to 1750 rpm. Each sheave has two C-grooves and is designed for use with company's Super-Service Wedgbelts. Unit is available in three sizes, with pitch diameters of 8.5 to 10.7 PD, 9.5 to 11.7 PD, and 10.5 to 12.7 PD.

American Pulley Co, 4200 Wissahickon Ave, Philadelphia 29, Penna

Illuminated magnifier called Flash-O-Lens, consists of a standard flashlight case and a special illuminating magnifier head. Battery-powered model, 7-power, sells for $14.85; electric plug-in model, also 7-power, sells for $16.85.

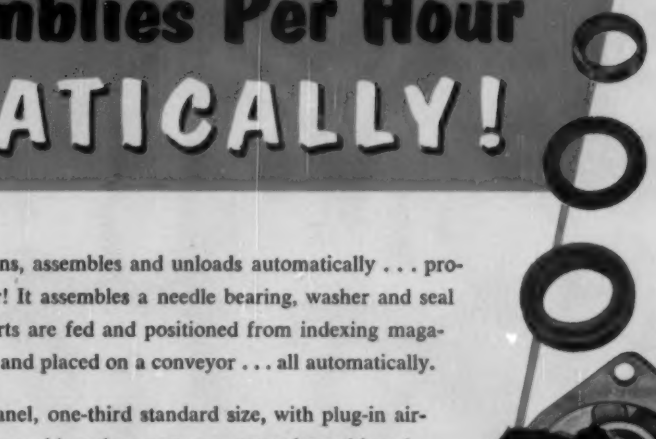
Abbeon Supply Co, 179-33D Jamaica Ave, Jamaica 32, NY

Magnetic inspection supplies, for all types of magnetic particle inspection instruments and systems, incude red, yellow, grey, and black powders; red and black paste and fluorescent paste and powder; bulb-type powder dispensers; colored inspection tapes, tags, and dispensers; and a new gun-type powder blower.

Sonoflux, PO Box 14543, Houston 21, Texas

Optical accessory for welding-helmet windows, called Magna-Weld Plate,

720 Assemblies Per Hour AUTOMATICALLY!



This Robbins "Assemblimatic" feeds, positions, assembles and unloads automatically . . . producing 720 four-piece assemblies every hour! It assembles a needle bearing, washer and seal in two sizes of a steering gear end cover. Parts are fed and positioned from indexing magazines, and completed assemblies are removed and placed on a conveyor . . . all automatically.

Machine features include: (1) Robbins panel, one-third standard size, with plug-in aircraft type relays and controls which prevent assembly unless parts are correctly positioned, (2) Index table with both barrel type cam and shot bolt for accuracy and magnetic operation of index and dwell, (3) Positive dwell time control through synchronous timer and electrical interlock at each station, (4) Hardened and ground ways, (5) Automatic lubrication, (6) Electrical and pneumatic equipment to J.I.C.

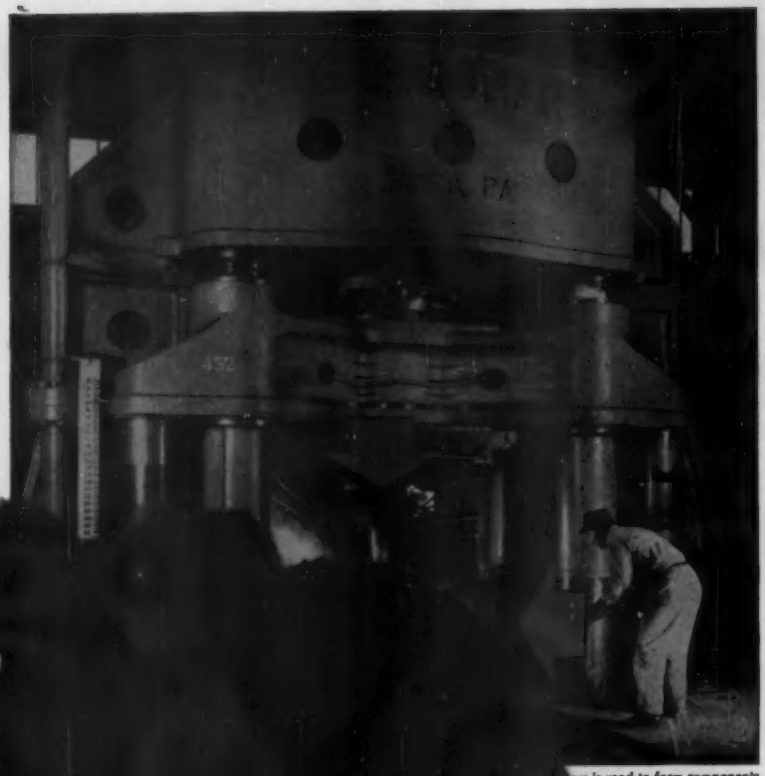
Robbins special assembly machines save manpower, speed production and improve quality, often combine machining with assembly for further savings. Automatic inspection, selection, orientation, assembly and in-process gaging assure consistent high quality production. Ask us for recommendations to help solve your automatic assembly or machining problem.

OMER E. ROBBINS COMPANY
24794 PLYMOUTH ROAD • DETROIT 39, MICH.

Robbins

SPECIAL MACHINES

New brochure describes and illustrates a variety of Robbins special assembly machines. Write for your copy.



ess is used to form components
Works, Inc., Houston, Texas.

Press
phery
tion
aving
ts in
per
olu-
om
the
ver
les
re.
to
ging
com-
We'll
SES
veyors

designed for use with personal glasses, fits behind the regular helmet filter lens where it is said to provide magnification for near vision throughout the entire window area. Device can be used with any standard welding helmet. Bulletin 33-B.

Sellstrom Manufacturing Co, Palatine, Ill

Cylinders, Type B, for air, water, or hydraulic service, are available in bores of 1½, 2, 2½, 3, and 4 in., with either single or double-ended rods. All sizes are also available as double-acting cylinders or single-acting spring-return cylinders. They have brass or steel barrels, are treated for corrosion resistance, and can be supplied with variety of mounts. Bulletin available.

A K Allen Co, 57 Meserole Ave, Brooklyn 22, NY

Cam-action carrier for use with Chainveyor overhead conveying system is designed to hold wide variety of flat materials. Automatic or manual release of special grip is obtained by applying slight pressure on extension of cam arm. Up to 30 lb per single load can be gripped and carried.

Chainveyor Corp, 5618 E Washington Blvd, Los Angeles 22, Calif

Magnifier, Model 0.185 Hands-Free, is worn on person, leaving hands free. It is attached by plastic cord around neck where it can be adjusted to any height. Device has 3⅞-in. double convex lens in clear plastic frame, weighs less than 6 oz, and sells for $5.95 FOB.

Pacific Transducer Corp, 11836 W Pico Blvd, Los Angeles 64, Calif

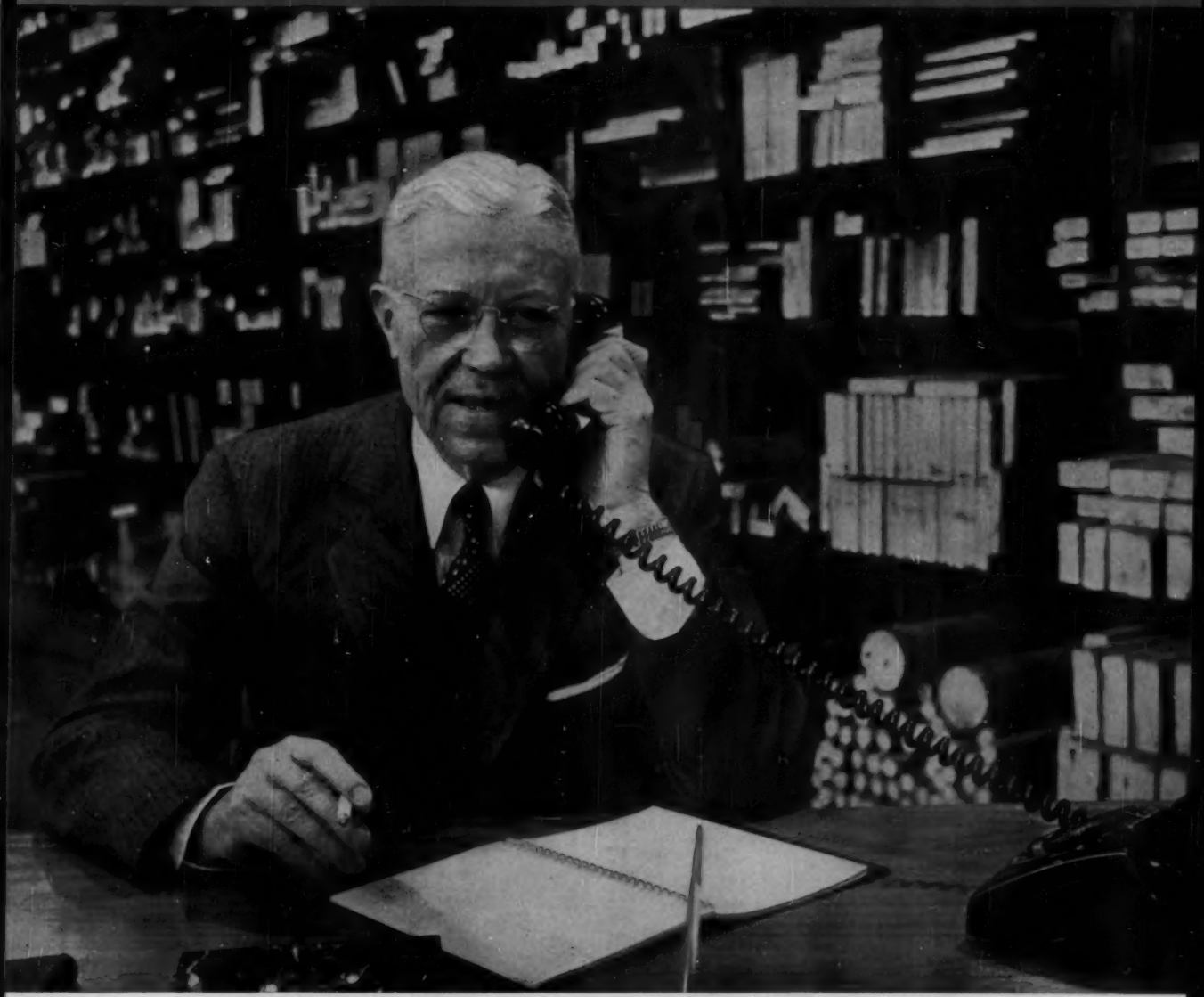
Aluminum handknobs are available with star-type or hex-type handles. Star type are available through-tapped or reamed; hex type, blind tapped or reamed; all plain knobs are centered. Sizes range up to 3-in.-max diameter. Minimum tensile strength is said to be 20,000 psi.

Northwestern Tool & Engineering Co, 117 Hollier Ave, Dayton 3, Ohio

Protective aerosol, a fluorine polymer with low-loss dielectric properties and excellent chemical resistance to acids, alkalies, salts, and organic solvents, can be applied to any material. After desired wet coat thickness is applied, the resin coat is

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corp.



For Answers to Tool Steel Problems

CHECK WITH YOUR BETHLEHEM DISTRIBUTOR

Virtually every business day you are faced with a question or two about tool steel. On occasion the solution is relatively easy, such as ironing out some detail about delivery. But often it can be considerably more complex—perhaps weighing the merits of two similar grades, or determining the proper cycle of heat-treatment to obtain a more effective die life.

Whatever the problem, it calls for expert opinion, and that's where your Bethlehem tool steel distributor comes in. For he's a specialist in tool steel matters, and it's part of his job to see that your questions are answered promptly and courteously. Besides, he can also save you time when you need tool steel, for his diversified stocks are ready to go at a moment's notice. Make it a point to check with your Bethlehem distributor often. It will take but a few minutes at most, and it's one of the wisest moves you can make.

BETHLEHEM STEEL

BIG, 6-FOOT LAPOINTE ROTARY TABLE

of extreme accuracy... can take loads up to 50 tons!

Indexing is semi-automatic or full-automatic, as desired, and guaranteed accurate within 10 seconds of arc. It will repeat consistently to within 5 seconds! Never before has a big production table been built offering such precision. Using master indexing gears, this Lapointe Rotary Table *cannot lose its accuracy*, regardless of the weight of the workpiece!

For programming, for tracing. Although originally developed by Lapointe as a broaching fixture, in smaller sizes, this Rotary Table can now be purchased separately and used for other machining purposes. Any external form can be milled or contoured to extreme accuracy. It will tilt to 90°. Can be made in any diameter from 30" up to 120".

Write for illustrated Bulletin RT-2

THE LAPOINTE MACHINE TOOL CO.
HUDSON, MASSACHUSETTS — U. S. A.
In England, Watford, Hertfordshire
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

LAPOINTE
known to be the best in
BROACHING

NEW SHOP EQUIPMENT

fused at 480 F. Final step is a cold water quench. Freon propellent and the basic monomer are produced by Du Pont.

Acme Resin Corp, 1401 Circle Ave, Forest Park, Ill

Surface plates, designated Valu-Plates, made of black granite-diorite are available from stock in four sizes—8 x 12, 12 x 18, 18 x 24, and 24 x 36 in. Portable and inexpensive plates are non-magnetic, and have a non-abrasive surface that is lapped to an over-all accuracy of 0.0002 in. Cabinet stands are available.

DoAll Co, 254 N Laurel St, Des Plaines, Ill

Skin-protective coating, Ply No. 9 Gel, is impervious to epoxies, amines, glass fibers, polyesters, styrene oxide, and most organic solvents. Material consists of a plastic dispersed in gel form in a water base, and is not recommended against water-base irritants. It is non-irritating, non-toxic, non-absorbing, and non-drying to the skin.

Milburn Co, 2246 E Woodbridge, Detroit 7, Mich

Exhaust purifier, designated Oxy-Muffler, reduces the amounts of organic material and CO in exhaust gases of company's Dynamotive line of industrial trucks. Reaction between catalyst and exhaust gases reduces amounts of hydrocarbons and CO 70% to 95% for a minimum of 1000 hr.

Yale & Towne Mfg Co, Automatic Transportation Co Div, 149 W 87 St, Chicago 20, Ill

Metal conditioner, designated Preprimer, provides superior corrosion protection for galvanized metal, aluminum, or sandblasted steel surfaces. Developed by Parker Rust Proof Co to take place of company's Bonderite phosphate treatment on metal surfaces that could not be Bonderized, material improves adhesion of following primer coats.

Tropical Paint Co, Cleveland 2, Ohio

Spray nozzles providing extremely small capacities and atomization using hydraulic pressure only are available in 12 sizes, in both male and female pipe connections, with capacities ranging from 0.042 to 1.400 gpm at 20 psi. Each nozzle is

IN BUSINESS MACHINES, TOO,

STANDS OUT

Sharonsteel Quality

• These machines are encased in Sharonart*—the popular rolled-in surface pattern steel. Sharonart is one of many steels developed by Sharon engineers during the past half century to help the Business Machine Industry make products look better, work more efficiently and last longer.

To change the style—change the steel to Sharonart Literature and sample kits upon request. **Sharonart*** is a trademark of the Sharon Steel Corporation.

SHARONSTEEL

For 56 Years a Quality Name in Steel

244

SHARON STEEL CORPORATION, SHARON, PENNA.

CHICAGO, CINCINNATI, CLEVELAND, DAYTON, DETROIT, GRAND RAPIDS, INDIANAPOLIS, LOS ANGELES, MILWAUKEE, NEW YORK, PHILADELPHIA, ROCHESTER, SAN FRANCISCO, SHARON, SEATTLE, MONTREAL, TORONTO

"MACHINERY ANALYZER saves us $1000 per hour..."

"We've had total savings of more than $100,000 since we purchased the analyzer three years ago. The analyzer has been shipped over 100,000 miles by air, rail, and car to our eight plants without need for repairs or replacements" — reports a leading chemical processor.

The Machinery Analyzer — actually a portable IRD Vibration Analyzer — is used for . . .

- TROUBLE-SHOOTING — to pinpoint faulty components exciting vibration *without costly dismantling.*
- MEASURING DISPLACEMENT — to accurately determine the condition of machinery *without costly dismantling.*
- IN-PLACE BALANCING — to dynamically balance at operating speed the accessible rotating components *without costly dismantling.*

Here are several examples cited by company officials:

- Detecting a broken gear in an important gear reducer saved a major loss of production.
- Savings of $2000 in balancing a ringer assembly because dismantling and loss of production were eliminated.
- A 450 HP motor was balanced, in place, at savings of $8000 to $10,000 in production and maintenance costs.

What portable IRD Vibration Analyzers are doing for this company — to reduce inspection, maintenance, and production costs — it can do for your company.

IRD

For further information — or an actual demonstration on your own machinery by an IRD field engineer — write today to International Research and Development Corporation 797-AM Thomas Lane, Columbus 16, Ohio.

supplied with strainer. Spray angles range from 50 to 67° ac capacity increases. Data sheet 4517 is available.

Spraying Systems Co, Randolph St, Bellwood, Ill.

Threading and tapping compound, Tapit, is said to reduce risk of tap breakage by providing a protective film between tap and material. Material is effective even on newer, tougher alloys, including stainless steels and titanium. It is available in 8-oz tubes, and 1, 2½, 5, and 10-lb containers.

DoAll Co, 254 N Laurel Ave, Des Plaines, Ill.

Grinding calculator is pocket-size guide for selecting proper abrasive wheel for grinding 17 commonly used metals. Selector indicates type of abrasive, grit size, grade, and bond for both straight and cup wheels. Device is 4⅜ in. in dia and sells for $1.

Abrasive Machine Tool Co, Dexter Rd, East Providence, RI

Valvair Hi-Speed Inline valves for brake, clutch, and other high-speed applications, are available in 2 and 3-way types, NO or NC, with integral pilots or for remote pilot operation. Extremely short poppet travel reportedly provides split-second response. Sizes range from ¼ to 1 in. NPT for working pressures of 10 to 200 psi.

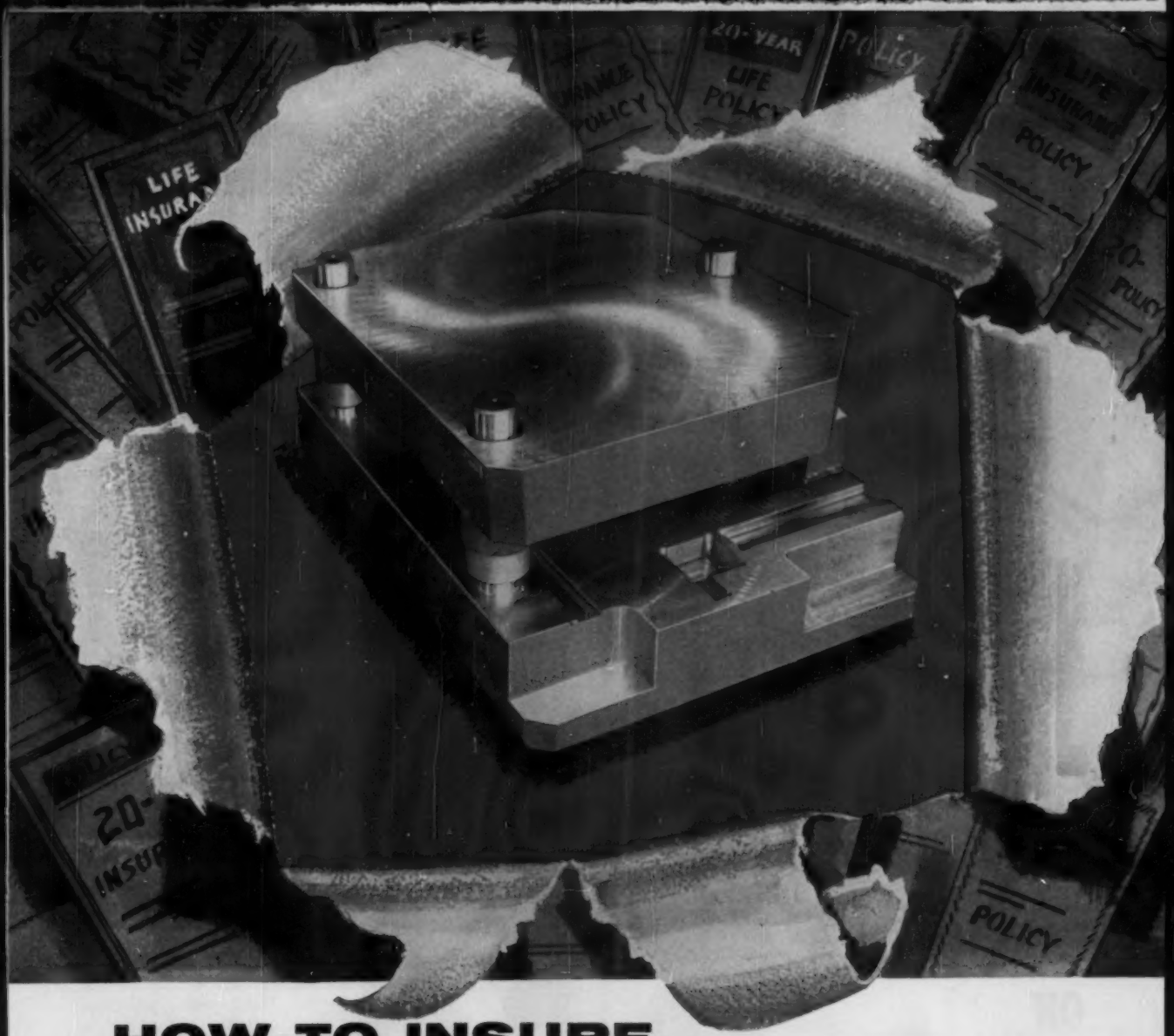
Valvair Corp, 454 Morgan Ave, Akron 11, Ohio

Burnishing compound, FM-103, reportedly produces smoother, brighter finish on aluminum, copper, brass, nickel-silver, gold, and mild and hardened steel. Designed for use with all types of barrel finishing media or with self-tumbling work, material is used in concentrations of 1 to 2 oz per gal of water.

Oakite Products, Inc, 124 Rector St, New York 6, NY

Whiteprinting machine called Crusader reproduces anything typed, written, drawn, or photographed on reasonably translucent material, at speeds up to 32 fpm. Exposure is by 4000-w mercury lamp; development by ammonia vapors. Unit handles materials up to 42 in. in width and practically any length.

C F Pease Co, 3991 N Rockwell St, Chicago 18, Ill



HOW TO INSURE YOUR COSTLY DIES . . .

DON'T buy "bargain-price" special die sets!

When you need a special die set it is usually for an expensive die . . . one that you really should protect.

The few dollars extra you may pay for a "Detroit-built" special are the cheapest insurance you can have that your costly die will get maximum protection.

Believe us—there is a lot more to a good special die set than some steel plate and a few pins and bushings.

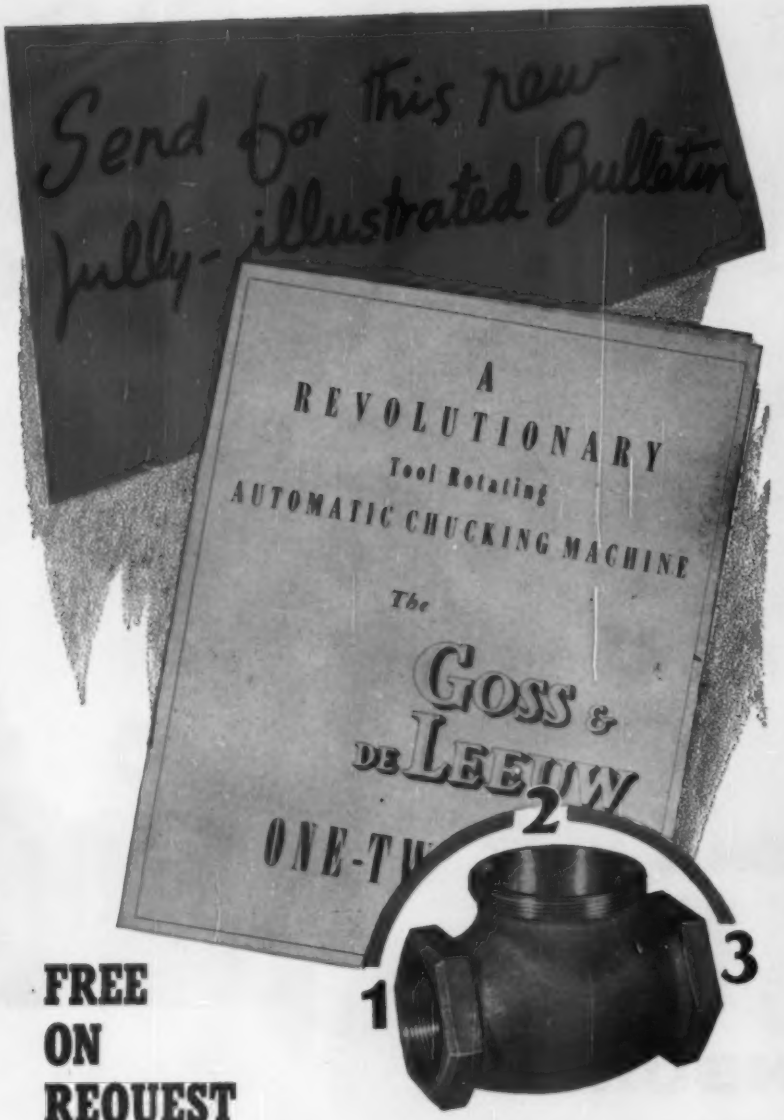
The protection your costly dies get from Detroit-built die sets is not accidental. It is built into every die set we make—standard or special—and we've been doing it for 30 years.

Sure, you can buy cheaper die sets, but they can be awfully expensive, too.

OFFICES IN PRINCIPAL INDUSTRIAL CENTERS

Detroit
DIE SET
CORPORATION

2895 WEST GRAND BOULEVARD • DETROIT 2, MICH.



FREE ON REQUEST

Here are the answers to most of your questions as to what "ONE-TWO-THREE" means in describing this outstanding development of Automatic Chucking Machines by Goss and De Leeuw. You'll be interested not only in the revolutionary design of the machine itself, but also in its extraordinary performance—and how it is possible to handle from one to three operations—in sequence or simultaneously—without changing set up.

Get this interesting, informative Bulletin NOW—by merely asking for it.

GOSS and DELEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

Round Table . . .

PAYOFF ON THE SLY

Is it possible to give a man a special raise for work unusually well done, a raise outside of regular routine increases? If it is done, should it be kept secret, or made public?

CAN SPECIAL merit increases be worked out to protect the foreman from demands by others who don't deserve them? Human nature being what it is, no scheme, however ingenious, is likely to protect the foreman from the attentions of the "something for nothing" gentry. Those money gate-crashers have the cheek of the nation and the skin of a rhinoceros. As a rule, they don't have what is needed to qualify for a merit increase and the few who have are too lazy to harness their latent mental and physical powers in the cause of rapid and economical production. They prefer to take life easy and, if possible, cash in on the enterprise and industry of others.

This was forcibly brought to my notice in a fracas over piece-rates. The malcontents contended that the high earners never got any of the tight prices.

They alleged favoritism at the hands of the foreman and demanded that all should have a turn at the good prices. The foremen and rate-fixers were called togther and a

"Cornpone—I said 'Strip down and completely disassemble the Machine!' "

ONLY GILBERT RADIALS

OFFER ALL THESE FEATURES

When you order a Cincinnati Gilbert radial, you get more new features per dollar than any other radial can offer. And every feature is designed to give you maximum return on your investment—in performance, productivity, and dependability.

Safety elevating nut protects both operator and machine

Weight carried on opposed Timken bearings

Hardened column available

Direct-reading speed and feed shifters; gears counterbalanced for easy shifting

Adjustable ball bearing rollers on hardened ring for maintained rigidity

Long heel on heavy base provides 360° stability

Powerful, accurate electric column clamp available

Four-lever turnstile cuts machine handling time

Balanced arm resists torsion, compression, tension forces

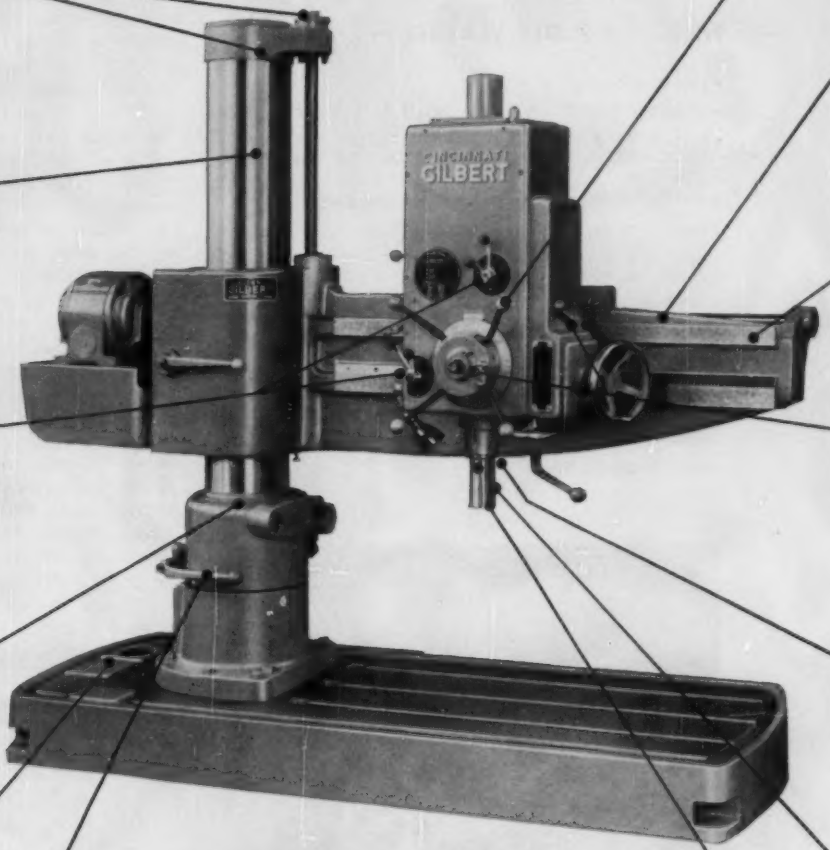
Head rides on anti-friction bearings; clamps three surfaces

When disengaging positive feed clutch, spindle won't drop

Full spindle support near tool; runout is less than .001"

Hardened tang slot is an exclusive Gilbert feature

You can always see the spindle; get extra use of spindle travel



And don't overlook these additional features:

- wide range of spindle speeds for efficient tool performance;
- hardened gears throughout the machine;
- standard or special tap leads available;
- modern styling which reduces housekeeping, convinces customers that your shop is up-to-date;
- low-cost financing: 8% simple interest (4¼% add on), up to 5 years to pay.

Write or call for Bulletin 349.

those who buy Gilbert buy Gilbert again

THE CINCINNATI GILBERT MACHINE TOOL CO.
3340 BEEKMAN STREET, CINCINNATI 23, OHIO

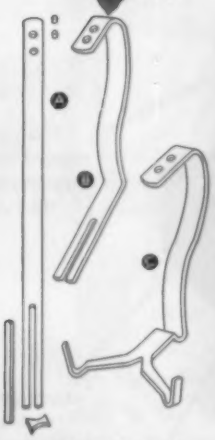
top performance IN MASS PRODUCTION

60 vaporizer stands per minute . . . automatically formed in one operation on an A. H. Nilson combination press and 4-slide. Kaz Vaporizer stands are a proof that clever product design, combined with precision tooling by Nilson, increases production and lowers costs.

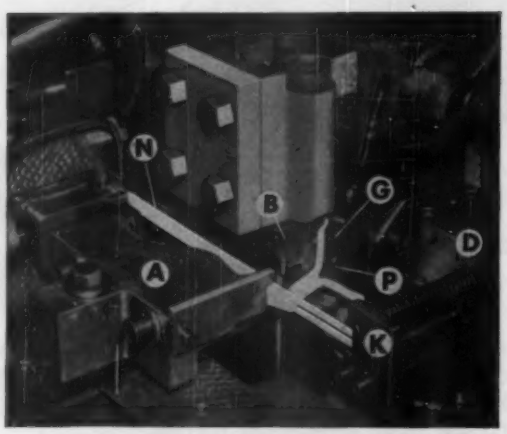
NILSON 4-SLIDES FEATURE—

- ONE-MAN OPERATION
- FORMING OF WIRE OR RIBBON METALS FROM THE COIL
- ONE FAST, AUTOMATIC OPERATION WHICH STRAIGHTENS, FEEDS, PIERCES, BLANKS, SWAGES, STAMPS OR COINS, CUTS OFF, FORMS
- CRITICAL TOLERANCES UP TO .002 ON ANY RUNS
- FAST TOOL AND DIE CHANGING
- WIDE SIZE RANGE—FORMS WIRE UP TO ½ IN. DIA. IN FEEDS TO 32 IN. MAX. AND RIBBON STOCK UP TO 3½ IN. WIDE
- PRESS SECTIONS—5 TO 30 TON CAP.
- HEAVY DUTY MODELS—50 AND 75 TON CAP.

Without obligation, Nilson provides specific forming recommendations from detailed information. Send for A. H. Nilson catalogue . . . the first step to increased production.



Stand is zinc-plated steel strip 0.05 in. thick by 0.625 in. wide . . . made in steps A, B and C.



Final step in forming Kaz stands on Nilson 4-slide. Feet are spread, bent, crimped (G) with workpiece (P) on centerpost while next piece (N) is being cut off. Stop (K) on right slide (D) backs off after cut and workpiece (P) is wrapped around centerpost by die (A) when finished part is clear.

THE A. H. NILSON MACHINE CO.

1519 Bridgeport Ave., Shelton, Conn.

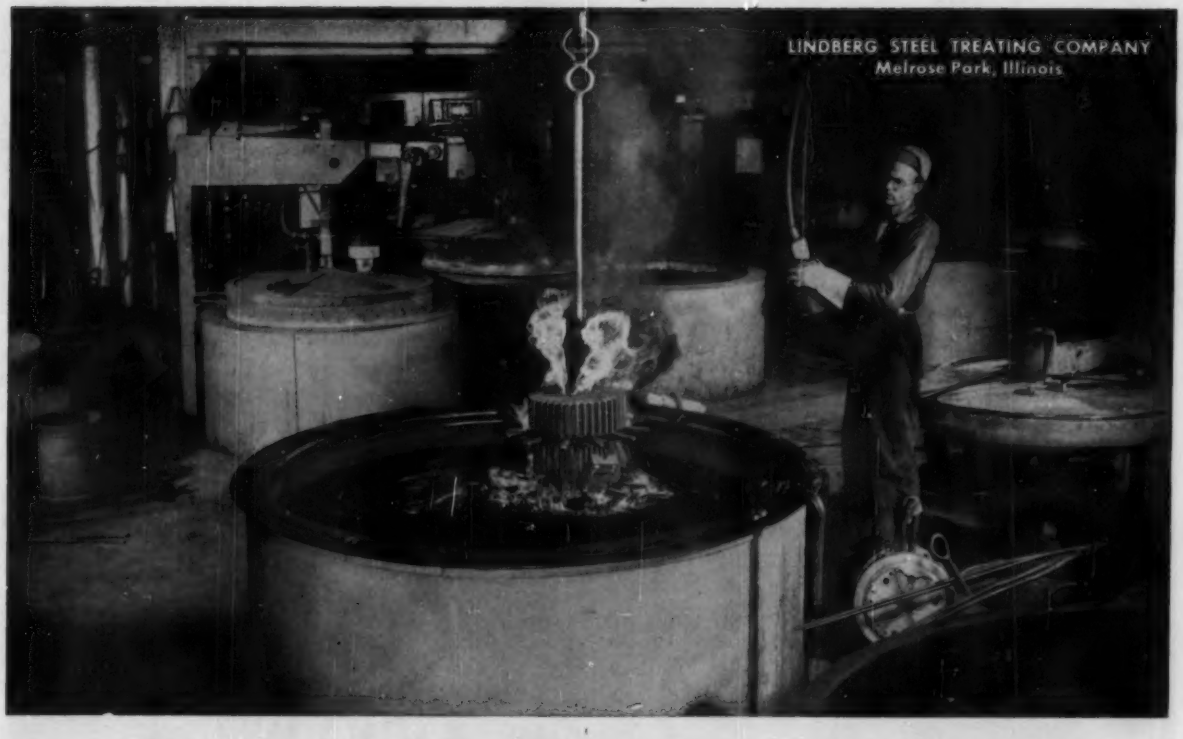
NILSON

careful examination of all prices was embarked on. Foremen are as anxious as any grouser that there should be no tight prices and no generous ones. That will be obvious to any production man. One snag was that what was a tight price to one operator was not tight to another. Experience, resource and versatility, allied to a determination to "make it" and the will to work, play a large part in determining whether a price is tight or not. The upshot was that the high-bracket earners made good money on the supposed tight prices. That did not shut up the grousers who, as is their habit, had a large stock of alternative arguments on hand. "The high bracket earners were old hands who knew the jobs well and knew all the ropes; their machines were generally better or more suitable," etc, etc. All the old familiar arguments of the man who never gets a square deal.

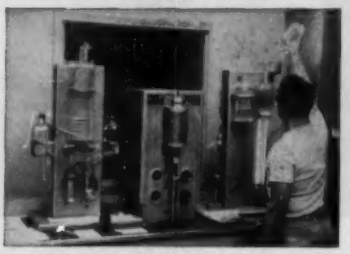
The findings were put to a meeting of the men, the majority of whom were content to leave well enough alone. The injured few would not be convinced and suggested a gang pool. The idea was to divide the men into gangs, or squads, retain existing prices and pool the earnings. Everyone would then take home the same amount of money at the end of the week. Needless to say, that brainwave came from men not noted for a high production record. Most of them were loud speakers, very sure of themselves and mighty pleased to have such a golden opportunity to parade the virtues of the socialist conception, fair shares for all. It is curious to note how reluctant the fast workers are to voice their ob-

(Continued on page 171)

". . . and, when it comes to safety . . . do whatever he says . . . no matter how goofy it sounds!"



For machine shop tolerances— Lindberg uses Cities Service Quenching Oil



Lindberg's Lab stringently tests treated metals. Dimensional changes from poor quenching oil would quickly show up here. But Cities Service Quenching Oil cools metal with no significant dimensional change.

Some of Lindberg's Furnaces. Here, they heat-treat all kinds of steel products . . . bolts, washers, gear blanks, saw blade segments, etc. Steel for bars of Illinois State Penitentiary was one of their first jobs.

At Lindberg Steel Treating Company a routine order might include a dozen shafts, stamping and forming dies, jigs and fixtures and even production parts. But though the products might differ, most would carry the same stipulation—heat treat with very low dimensional change.

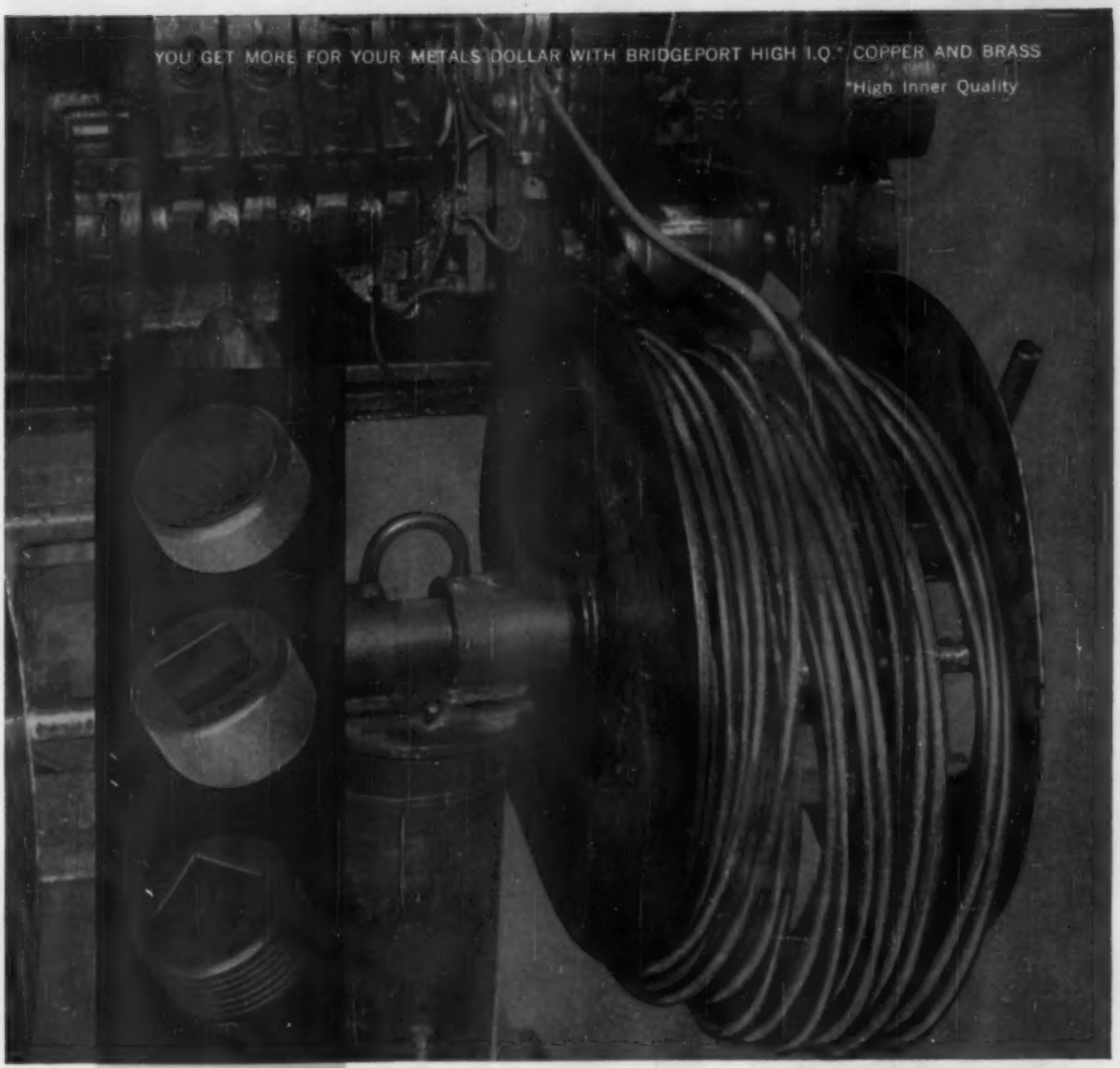
To some heat treating operations this might present a problem, but not to Lindberg. By the use of Cities Service Quenching Oil, they're able to cool their steel with no significant changes in dimension.

"In addition," say Lindberg metallurgists, "we like Cities Service Quenching Oil because it has high flash point, consistent viscosity, excellent oxidation resistance, and a stable cooling rate."

Anyone looking for a better quenching oil would do well to try this superior Cities Service oil. For further information, talk with your local Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS



Progressive steps in the manufacture of a Pittsburgh Plug from Bridgeport Wire. Part is cut off, upset to form a tapered blank and roll threaded.

Easy on the dies... Bridgeport cold heading wire

The pipe plugs illustrated are just one of many different cold headed and cold rolled products made by Pittsburgh Plug & Products Co., Pittsburgh, Pa. When you're producing products such as these in such variety and in large volume, you have to be mighty careful on materials specifications. You need an alloy that not only readily cold forms but which will hold prescribed tolerances at high production rates. Otherwise, scrap losses and rejects mount up.

The answer in this case was Bridgeport Yellow Brass Wire, Alloy #16, the most popular and versatile of Bridgeport cold heading wires. Used in a scrapless nut former which makes possible a materials savings in excess of 40%, Alloy #16 meets all the requirements of the job which calls for wire to a prescribed OD with rigid tolerance specifications.

Yellow Brass Wire is just one of the many Bridgeport alloys for cold heading. It will pay you to check with your local Bridgeport Sales Office for help in selecting the alloy best suited to your production and product method. Our Service is prompt, dependable, backed by Bridgeport's Technical Service.

matched Bridgeport Brass Alloys *to your job*

BRIDGEPORT BRASS

Offices in Principal Cities • Conveniently Located Warehouses

Bridgeport Brass Company, Bridgeport 2, Connecticut
In Canada: Noranda Copper and Brass Ltd., Montreal

jection to proposals inimical to their interests, when those proposals come from professing social reformers.

When they do speak up, their contributions are often couched in apologetic reference to their own production earnings, almost as if half ashamed of their achievements. One, bolder than his fellows, was timidly critical of the "gang warfare" on the grounds that, to be fair, provision for the removal of lead swingers and drones would have to be made. He also thought that something must be done about the bad timekeepers who, he intelligently observed, could not expect the same take-home as those who always worked a full shift. This mild assault brought a storm of indignant protests from the horrified reformers. The very idea that anyone should sling the hatchet, or take time off unnecessarily, fairly scorched their souls. They disclaimed, repugnantly, such unsocial behavior and were ready to answer for the good behavior of every honest worker in the company. From the halting manner in which "honest worker" came over, it was clear that "honest" was an afterthought.

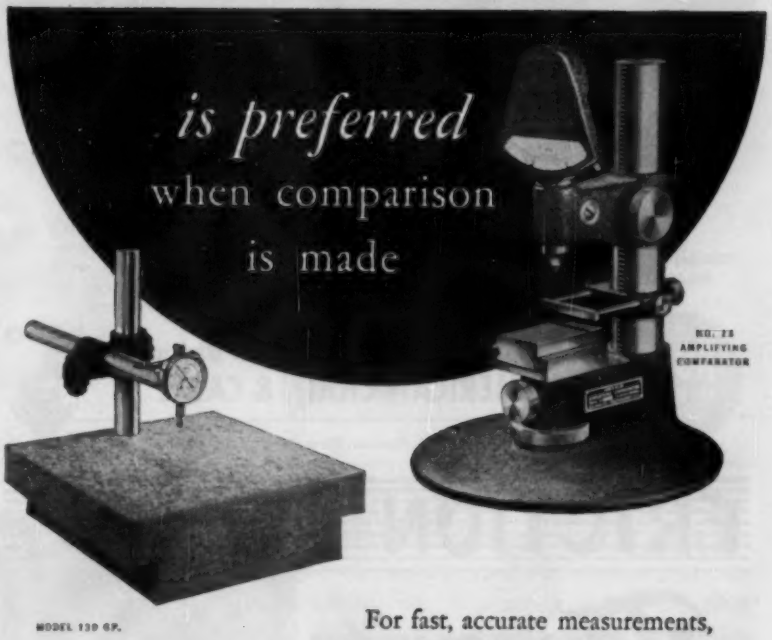
Harmony was to be the keynote of the scheme. No more swaggering, big-pay men, no more foreman's darlings, no frustrated underdogs who, despite their talents and enthusiasm, never got a chance. Just one big happy family, with everyone mucking in and all taking home exactly the same weekly wad. After a shaky start, the experiment seemed to steady up, but not for long. It had a life of precisely eighteen weeks, then cracks began to show in the structure. The reformers did much better than I had anticipated. They stuck steadily at their work in the early flush of enthusiasm, instead of loitering and preaching the dignity of man, but they could not keep it up. The grousers soon tired of harmony and equal pay. Inevitably, they again became critical about tight prices. Though their money was no worse than others, tight prices was something to grouse about.

Ultimately, a deputation to the management, seeking another review of existing prices brought the whole edifice about their ears. The company announced that the experiment had been given a fair trial and had failed in its objective to foster harmony and contentment. From that period onward, gang working was discontinued; every man was on his own and any dissatisfied with their earnings or conditions were advised to seek work elsewhere.

No, I don't think the foreman can

AMES

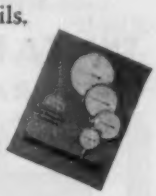
is preferred
when comparison
is made



MODEL 130 GP.

For fast, accurate measurements, Ames Dial Comparators are the choice of quality control men everywhere. You get definite, impersonal readings directly from the dial. There's no guesswork or figuring.

Special comparators are available for measuring resilient materials such as rubber, paper, etc., and for measuring non-yielding materials such as sheet metal, glass and plastic. Write for complete details.



Representatives in principal cities

B.C. AMES CO.

26 Ames Street, Waltham 54, Mass.

MANUFACTURERS OF MICROMETER DIAL GAUGES • MICROMETER DIAL INDICATORS

WILSON "ROCKWELL"—
THE WORLD'S STANDARD OF HARDNESS TESTING ACCURACY

WILSON "ROCKWELL"
DIAMOND
"BRALE" PENETRATORS

A FULL WILSON LINE
TO MEET EVERY HARDNESS
TESTING REQUIREMENT
FULLY AUTOMATIC
•
SEMI-AUTOMATIC
•
REGULAR
•
SPECIAL
•
SUPERFICIAL
•
TUKON MICRO & MACRO
HARDNESS TESTERS

With WILSON Diamond "BRALE" Penetrators the accuracy built into your "ROCKWELL" hardness tester is not jeopardized. Thus, there is no danger of your rejecting good parts, passing sub-standard parts or endangering your good name with your customers. Inaccurate measurements with less expensive, inferior quality diamond penetrators are a hazard you cannot afford.

WILSON "ROCKWELL" Hardness testers—with WILSON Diamond "BRALE" Penetrators, carefully selected and scientifically ground with painstaking accuracy, combine to insure perfect Rockwell hardness testing every time.

ACCO
for Better
Values

Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE

230-B Park Avenue, New York 17, N. Y.

ACCO

FRICTION SAWING

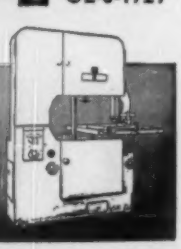
with Tannewitz
HIGH SPEED BAND SAWS

FASTEST, BEST MEANS
OF CUTTING METALS

If you are not familiar with the advantages of friction sawing with these machines, by all means drop us a line asking for "Friction Sawing Data." You can save many times the cost of a Tannewitz High Speed Band Saw and greatly expedite production by using it to cut sheets of both hard and soft steel, formed or flat, trimming malleable and steel castings, cutting armor plate or many other materials. Write NOW!

THE TANNEWITZ WORKS ☎ GL-6-1729
GRAND RAPIDS, MICHIGAN

TANNEWITZ DIE-SAWS
24", 36", 48", 60" CAPACITIES
for CONTOUR SAWING, FILING, POLISHING
The smoothest, fastest, most trouble-free Di-Saws on the market. Write for bulletin.



be protected from the attentions of the undeserving in quest of easy money. That annoyance is only one of the several crosses peculiar to foremanship. I likewise don't know the answer to the problem; secrecy isn't, because there is no guarantee of secrecy. Publicity might be a palliative, I don't know that it would be a cure. I fear there will be no cure till one is found for the frailty of human nature.

I Y Parkinson
Northants, England

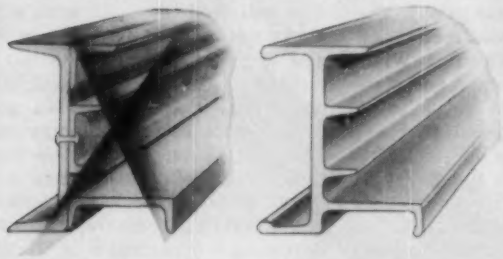
To ANYONE who has any idea whatsoever about the frailties of human nature, it certainly is apparent that granting an increase in pay with the expectation of it not reaching the ears of the fellow workers is utter folly. Were any man to strive to keep his increase to himself he would have to be a freak of nature. Can you imagine the little woman remaining quiet—naturally the husband is going to spill the works when he gets home.

Were the recipient to successfully conceal the "private" deal between the foreman and himself it wouldn't remedy the situation at all. I see no reason why there should be any secrecy about a man getting what is due him. For a foreman to ask one of his men not to tell others about it is nothing more than kid stuff. Let the others badger all they want to and if the foreman is made of the

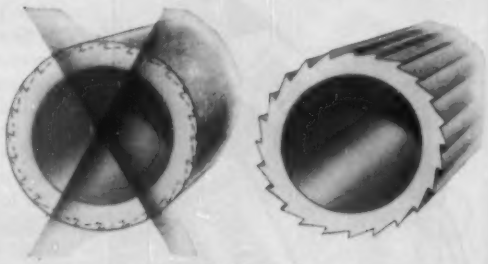
"I am not cuttin' in on your job—Put me down!"

Cost-Cutting Aluminum Extrusions . . .

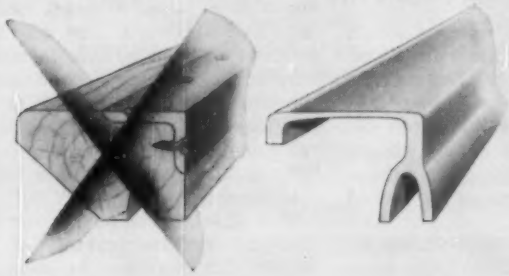
1. eliminate joining



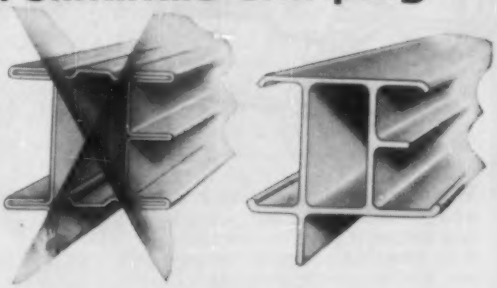
2. eliminate machining



3. eliminate reinforcing



4. eliminate crimping



HERE'S ONE WAY EXTRUSIONS SAVE AND IMPROVE . . .

NEW

Reynolds "ALL-AIR" * truck flooring

Here's a new Reynolds extruded aluminum product that really saves . . . both in production and in use. Made of simple, strong interlocking extruded aluminum panels, this new "All-Air" reefer flooring gives truck operators the light weight and heavy duty service they want. It would be impossible to produce this efficient, cost-cutting flooring any other way, in any other metal.

* TRADE MARK; U.S. PAT. PENDING

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

It's quite likely that your plant is producing part of a product that could be improved—at a lower cost—by an aluminum extrusion. You can turn out the most complex shapes through low-cost, accurate extrusion dies—and you can often minimize or eliminate machining, joining and finishing operations.

For example, in No. 1 above, a single aluminum extrusion replaces several rolled structural shapes that have to be joined. In No. 2, extruded aluminum tubing does away with the need for machining ordinary tubing or rod. Or, in No. 3, a stiffer, lighter, stronger extruded aluminum shape does the work of a wood-supported metal angle. And, as in No. 4, an aluminum extrusion provides the required shape with added stiffness and without investment in expensive roller dies.

Reynolds Design and Engineering Services will work with engineers and design consultants in improving and cutting the cost of your products with extrusions and other forms of aluminum. For their assistance or to obtain a complete aluminum literature and movie index, call the Reynolds office, listed under "Aluminum" in your classified phone book. Or write *Reynolds Metals Company, P. O. Box 1800-JJ, Louisville 1, Kentucky.*

How Alcoa Aluminum Fasteners make good furniture even better

With your good name riding on every aluminum chair, chaise and settee, it pays to assemble with Alcoa® Aluminum Fasteners. You get perfect color match and lasting good looks with absolute protection against both galvanic and atmospheric corrosion. Your local Alcoa distributor has a complete stock of aluminum fasteners to meet your every need. He is listed in the Yellow Pages of your telephone directory.

THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

ALCOA
ALUMINUM
FASTENERS
ALUMINUM COMPANY OF AMERICA
ALCOA

Your Guide to the Best in Aluminum Value

Fill out coupon for facts, samples

Aluminum Company of America
2238-C Alcoa Bldg., Pittsburgh 19, Pa.

Gentlemen:
Please send complete specification data and samples of Alcoa Aluminum Fasteners.

Name_____

Title_____

Company_____

Address_____

right stuff he will tell them flatly that when they deserve an increase they will get it and not a minute sooner.

I am of the opinion that a record of each employee be kept on file and when he has performed exceptional work recognition will be made in due time by an increase in pay. The desire to establish a good record will not decrease the man's effort. When a man goes to his foreman and complains that he should get a raise, simply because he heard that another was given one, he should be escorted into the office and confronted with his record. Were the records kept in proper order the foreman would find them a great asset in determining the man's justification for his howl or enabling him to convince the bellyacher that he should feel glad that he is kept on the payroll.

I'll admit that the workers would make the foreman's life a little easier if they didn't open their mouths so wide and let it be known that they did get an increase. No one deserves to get more money simply because someone else got a raise—the only reason is because he worked for it.

If it is known that Bill Harris got a raise on the sly, then it looks as though favoritism has been shown. Nothing will disrupt the initiative of the rest of the crew more than the appearance of a "pet" in the shop. I doubt very much if a foreman will ever be relieved of the constant demands of his men for more money. Particularly has this parasitic perversity become evident of late years. The only time when he can feel relieved of this annoyance is when he is dressed in his best and holding a white rose in his cold hand.

Another way to relieve him while he is still on the up-and-up is to have the matter of adjustment in pay handled by a special department, leaving the foreman free to pursue more productive efforts.

Jack Everett
Laguna Beach, Calif

BENJAMIN FRANKLIN once said "A secret is safe with three people when two of them are dead."

The foreman should realize it is a poor idea to establish a policy of giving secret raises. Once it becomes known that the foreman hands out such raises the hunt will be on. Every time an employee gives an indication of prosperity he will be suspected and accused of having received a raise.

What will this do to the buddy system in the shop? In general everyone in a shop has a particular friend that they eat lunch with; a buddy who will help them out with a few bucks until pay day. When a man gets a secret raise will he tell his buddy? If he does, that will make one more person who knows about it, one more tongue that may make a slip. If he does not tell his friend there will be hard feelings when this information finally does leak out, and it is sure to come out eventually. A few such occurrences in the shop and everyone will be suspicious of the others.

When a man does a good job he deserves a reward in the form of a bonus or a raise. A secret raise is only half a reward. The man who gets one will not be able to tell his friends about his success and will be constantly concerned about his secret leaking out. He will hesitate to tell them for there is an old saying "The man who tells another his secret becomes his slave."

This situation can be met and handled by some serious-minded employees but there will be some conscientious employees who would rather not have a raise under these restrictions. They would be concerned about their friends' feeling toward them and they may actually feel guilty and under suspicion.

The best plan is for the foreman to adhere to the established procedure and grant raises according to the company plan. In this way a raise will be a real reward.

Sing Yen
Brooklyn, NY

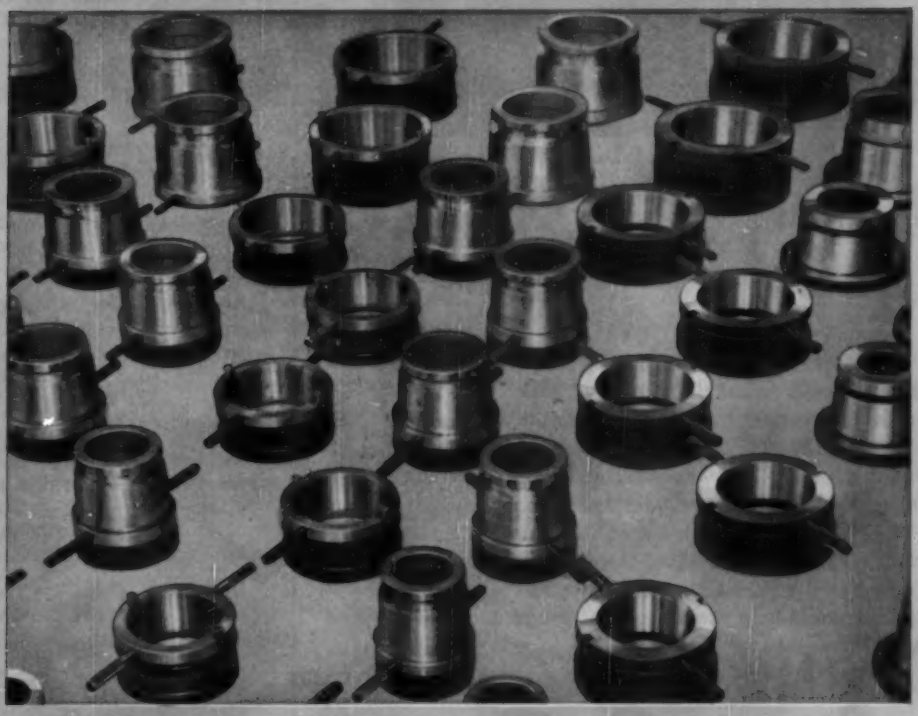
"That foreman never worries about tomorrow. He's certain every thing is going to go wrong!"

Pipe Machinery Oil Field Gages Keep Pipe Flowing to Satisfied Customers

One of the largest producers of pipe and tubing for oil country production has found that its investment in Pipe Machinery gages has paid good dividends. The use of these gages has resulted in improved customer relations as well as reduced their own scrap ratio to the lowest point in their history.

Oil country gages are among the most accurate required by Industry today. The American Petroleum Institute requires that each set of Master gages be certified by the National Bureau of Standards before use.

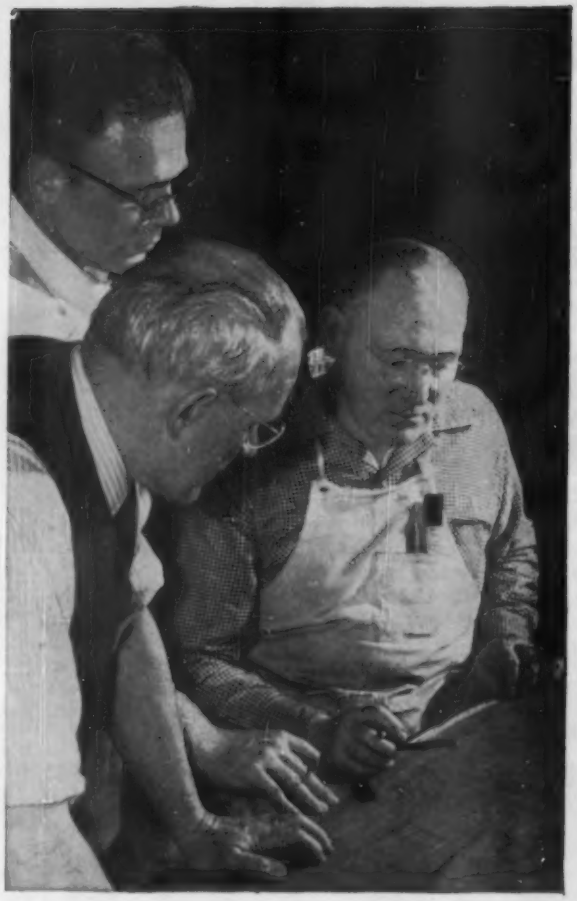
These gages, which are shipped all over the world, are produced by the same team of highly skilled and dedicated craftsmen who make all our gages. This group of men have but one ideal—producing the most accurate gages possible, resulting in lower costs to you. We can help you with your problems.



THE PIPE MACHINERY COMPANY

29100 Lakeland Blvd. • Wickliffe, Ohio

Greater Cleveland



it's a job for CDT

Faced with a special tooling job? Stymied by a tough problem? Would 50 years of experience help? Then the logical answer for you is to send it to Columbus Die-Tool! CDT specializes in tools, jigs, fixtures and also special machinery, designed and built to produce your products better, faster, and more economically.

That's why so many of the nation's leading manufacturers avail themselves of the specialized services of Columbus Die-Tool. Perhaps CDT can solve your tooling problem and help you make your product . . . better for less.

Columbus Die-Tool
AND MACHINE COMPANY

P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*

Names in the News . . .

Paul R Shawver has been named manager of Square D Co's Cedar Rapids, Iowa, manufacturing plant. Formerly assistant to the vice president of the distribution equipment division in Detroit, he succeeds **C Howard Brittenham,** who has resigned.

Arnold Wihtol has been appointed manager of manufacturing for the tube division of Varian Associates, Palo Alto, Calif. He moves up from the post of production superintendent.

Walter A Cox, general manager of W W Alloys, Inc, Detroit, has been elected president of the Resistance Welding Alloy Association.

J Zach Higgs has been promoted from assistant to resident manager of Norton Co's Huntsville, Ala, electric furnace plant.

Joseph R Smith has been appointed western district manager for Flick-Reedy Corp, Melrose Park, Ill. He will be responsible for sales for the firm's two divisions: Miller Fluid Power Div, manufacturer of hydraulic and air cylinders, and Tru-Seal Div, producer of self-sealing pipe fittings.

Benjamin Torrison has been promoted from assistant to superintendent of the production control department at Allis-Chalmers Terre Haute Works. He succeeds **John Rehorst,** who has resigned.

Nils Lindstrom, division foreman, has been promoted to superintendent of the Tool Division of Moore Special Tool Co, Bridgeport, Conn. He succeeds **William D Angell,** who has retired.

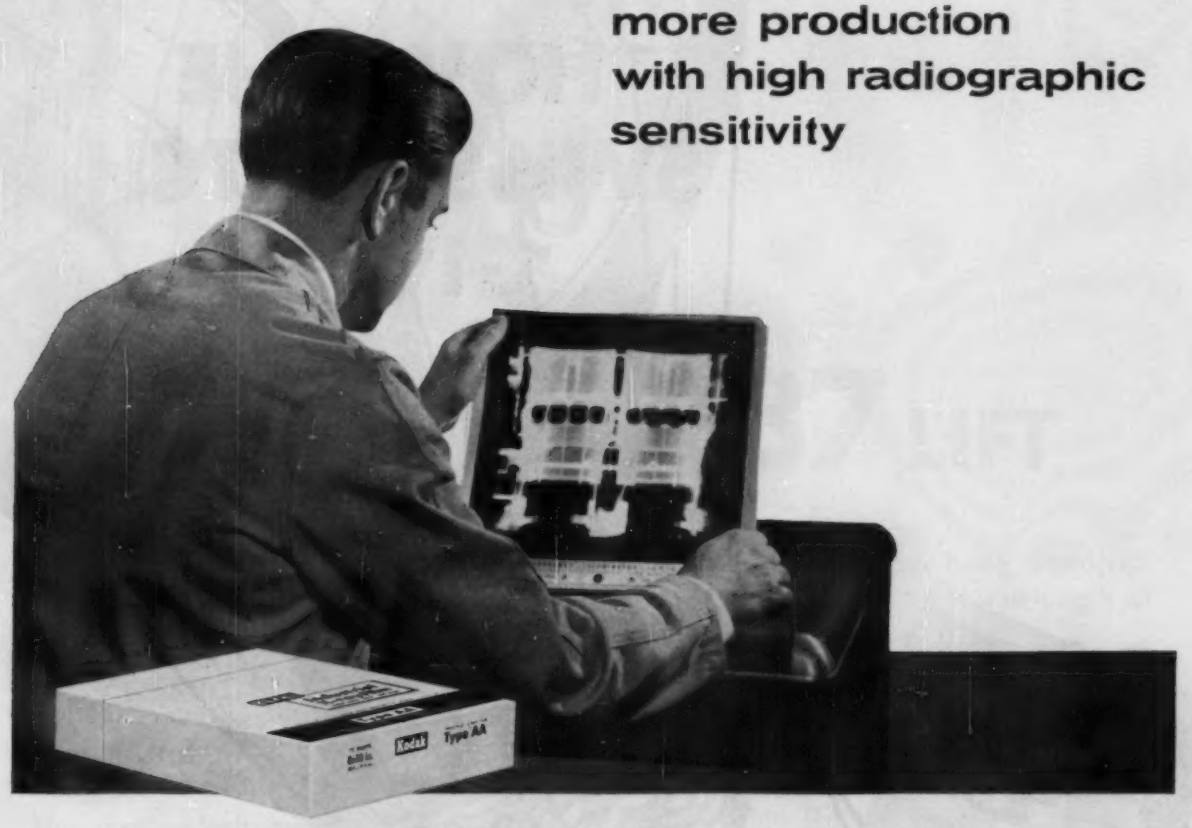
Richard D Deuchar has been appointed general sales manager of materials handling equipment manufactured by Randolph Industrial Equipment Co, Franklin Park, Ill.

Howard F Cole has been named manager of sales for the US Steel Supply Division, Newark, NJ.

Leonard Shelley has been elected vice president of Federal Pacific Electric Co, Newark, NJ. He will continue in charge of the company's western sales region with headquarters in San Francisco. **Robert L Bobo** has been appointed general sales manager; he was previously Great Lakes regional sales manager.

WHATEVER YOUR PRESENT RADIATION SOURCE–

more production with high radiographic sensitivity



KODAK INDUSTRIAL X-RAY FILM, TYPE AA

Whatever source of radiation you use, you'll get more high-quality work done—faster—with Kodak Industrial X-ray Film, Type AA.

For Type AA has greatly increased speed—as much as twice as fast with gamma rays and high kv x-rays. It permits inspection of thicker parts, slashes exposure time, increases production and extends the usefulness of existing radiographic equipment.

And with all this increased speed the new film equals the fine radiographic sensitivity characteristics which made Kodak Type A the most widely used x-ray film in the industry.

Kodak Industrial X-ray Film Type AA can save you time; provide clear, easier-to-read radiographs; and help turn out more work. Get all the details—either from your Kodak x-ray dealer or the Kodak Technical Representative.

Read what the new Kodak Industrial X-ray Film, Type AA, will do for you.

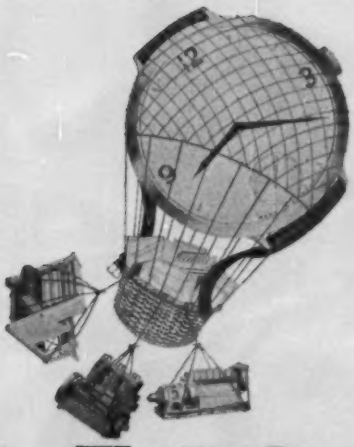
- Reduces exposure time—speeds up routine examinations.
- Provides increased radiographic sensitivity through higher densities with established exposure and processing technics.
- Gives greater subject contrast, more detail and easier readability when established exposure times are used with reduced kilovoltage.
- Shortens processing cycle with existing exposure technics.
- Reduces the possibility of pressure desensitization under shop conditions of use.

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

For welding, use Kodak Industrial X-ray Film, Type AA, in the new 70mm x 550' package.

Kodak
TRADE MARK

HOW THE
SWISS WATCH
GIVES
AMERICAN
MACHINERY



A $26,568,287 LIFT

That little Swiss watch is a powerhouse.

It helped hoist a cool $26,568,287 worth of American machinery to the Alps last year. Gas and Diesel engines. Tool and textile machines. Dynamos. Printing presses. Just think of any type of machinery, and the odds are high the Swiss buy it from American manufacturers.

How does the Swiss watch do it? It's a matter of simple machine-shop economics. The Swiss buy American goods with the proceeds of what they sell over here. About half their sales are the products of their three-hundred-year-old watch industry. And the Swiss pay as good customers do . . . *in cash!* And it's all trade. No aid.

As a matter of fact, Switzerland is America's best cash customer in Europe. A customer who has spent in America every dollar she has earned in America since 1946—plus 50% more! American business has gained a fat, favorable trade balance of $500,000,000!

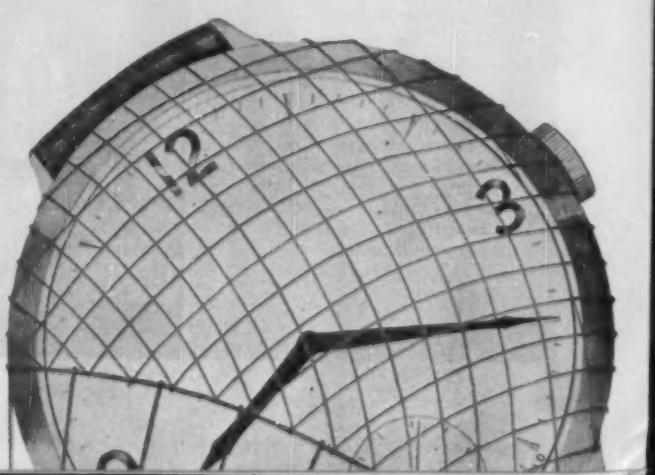
The present chapter in this bright business romance opened with the reciprocal trade agreements of 1936 between our two democracies. But the next chapter could tell a different story.

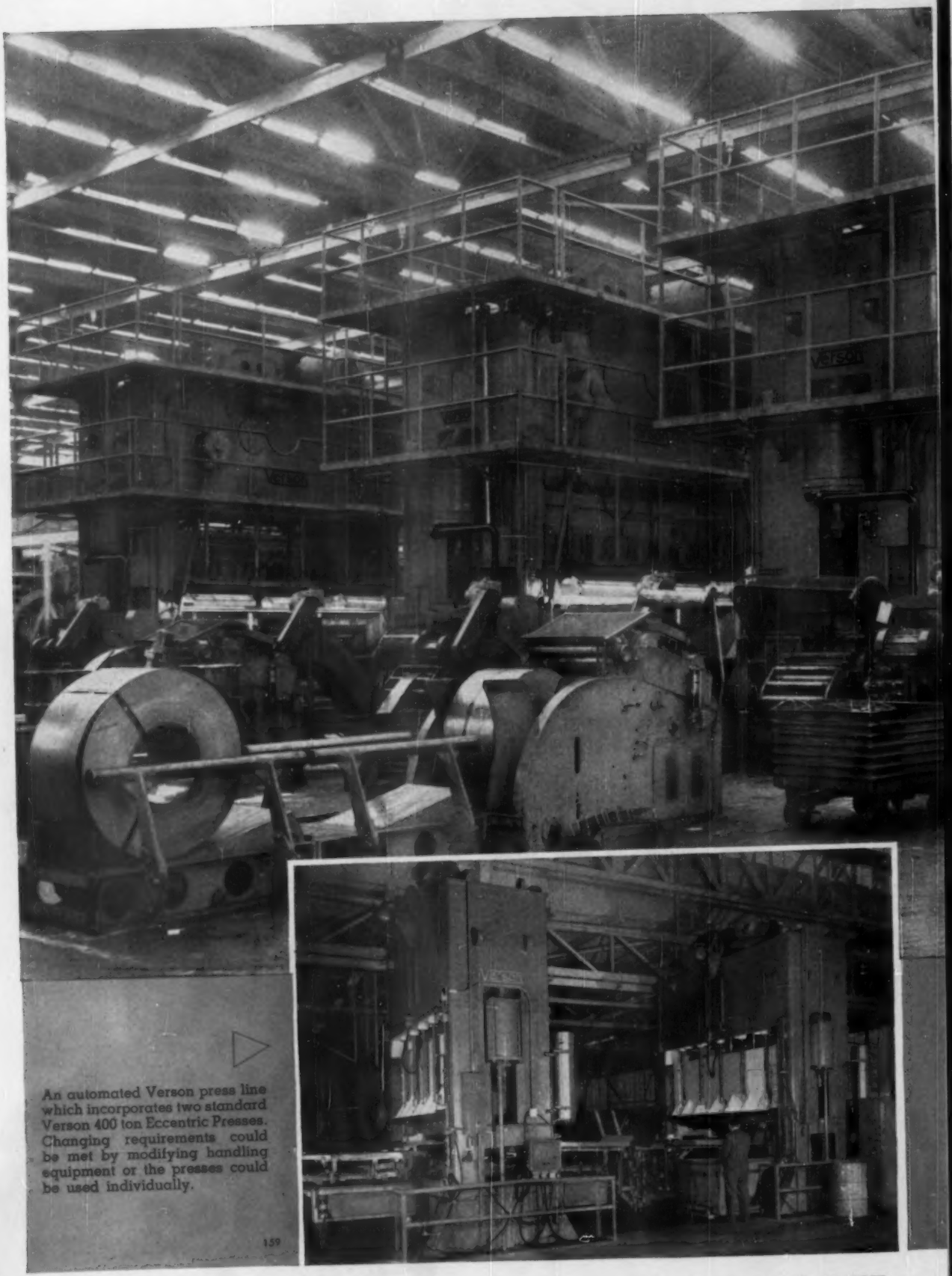
In 1954, America hiked the tariff on jeweled-lever Swiss watch imports by a huge 50%. Since then, further restrictions are being considered. And they could price the Swiss watch right off the wrists of Americans!

But the friendship between the Swiss and the Americans has gone on for a long time, since before our great-grandfathers were born. And the reciprocal trade between us has gone on for a long time, too. It was brought about by men of good will and good business. Surely, today's men of good will and good business will want to prevent anything coming between us now.

Published in recognition of the 106th anniversary of The Treaty of Friendship and Commerce pledged between the people of America and the people of Switzerland

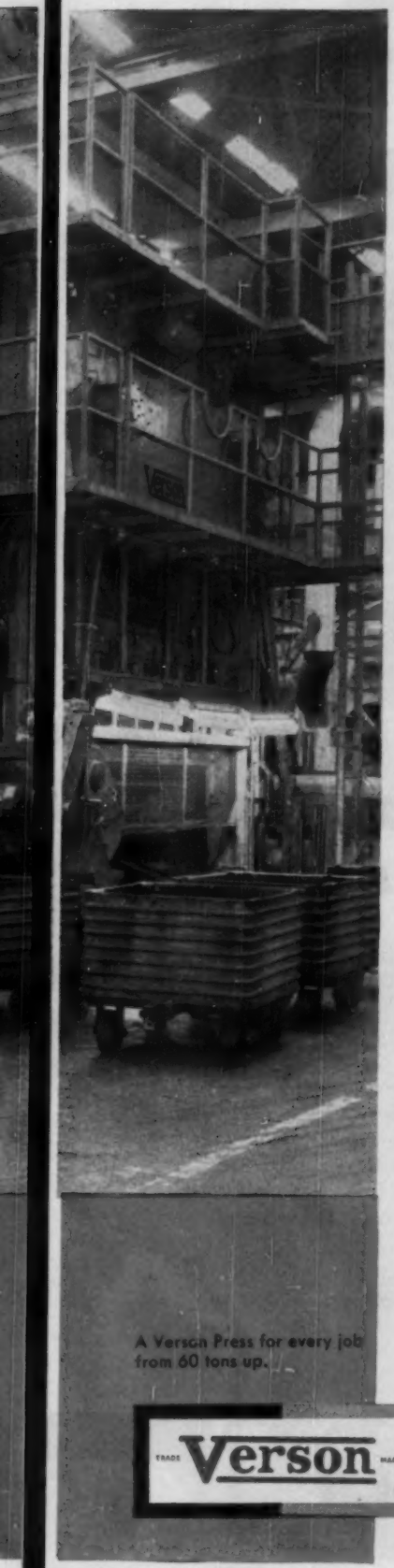
THE WATCHMAKERS OF SWITZERLAND





An automated Verson press line which incorporates two standard Verson 400 ton Eccentric Presses. Changing requirements could be met by modifying handling equipment or the presses could be used individually.

159



A good example of Transmat versatility. Each of these three identical 800 ton, 8 station Verson Transmats is capable of making any of four different automotive parts at the rate of 1000 per hour.

You can combine versatility with automatic high speed production

. . . with Verson Transmat Presses or an automated Verson press line

Verson Transmat Presses or Verson Automated Press Lines are designed first and foremost for the purpose of producing a specific multi-operation stamping in large quantities at the lowest possible cost. Any other consideration is secondary to the achievement of this objective.

However, Verson engineering has made it possible to offer surprisingly broad versatility in machines that would normally be considered single purpose. The Transmat, for example, has individually adjustable wedge slides which may be arranged for ram cushions. Adjustable stroke individual knock out cylinders are provided at each station. A variety of bed cushion arrangements is available. Provision can be made for stack or coil feed. Non-oscillating feed bars are adaptable to changing requirements. By taking advantage of these features, users have been able to make more than one part on the same Transmat.

The automated press line, since it often incorporates standard presses, is even more versatile. Handling equipment can often be modified to accommodate radical changeover.

If uncertainty about the adaptability of high production tool ups to changing requirements has kept you from taking advantage of the cost reductions they make possible, it is time to talk to Verson application engineers. They will welcome the opportunity to show you what has been done and what can be done. And remember, the Verson concept is to give you versatility without sacrificing the cost cutting advantages of high output.

A Verson Press for every job from 60 tons up.

TRADE Verson MARK

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

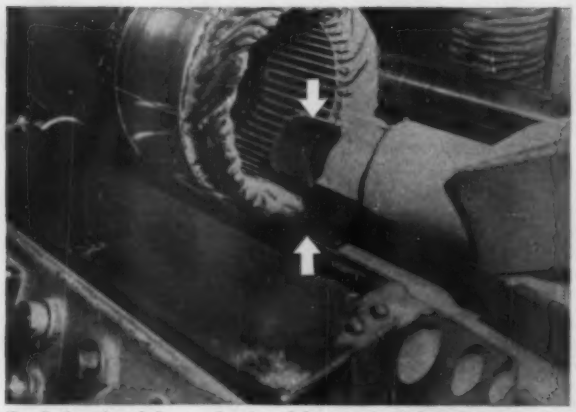
9316 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • 8300 S. CENTRAL EXPRESSWAY, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES
TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

OSBORN BRUSHING METHODS *worthy of your confidence*

Fast cleanup...

inside and out with Osborn Power Brushing



Dual cleaning job *at a fraction of the cost using Osborn Power Brushes.*

THE problem—to clean varnish from both the inside and outside surfaces of electric motor stators. Formerly, two cleaning operations were necessary. Results were inconsistent . . . the operations costly and time consuming.

With Osborn Power Brushes, the entire cleaning job is now done at the push of a button—and for a fraction of the previous cost. The operator merely places the stator on guide rolls. Brushes are automatically moved across the external and internal surfaces of the lamination stack. The varnish is quickly and thoroughly removed.

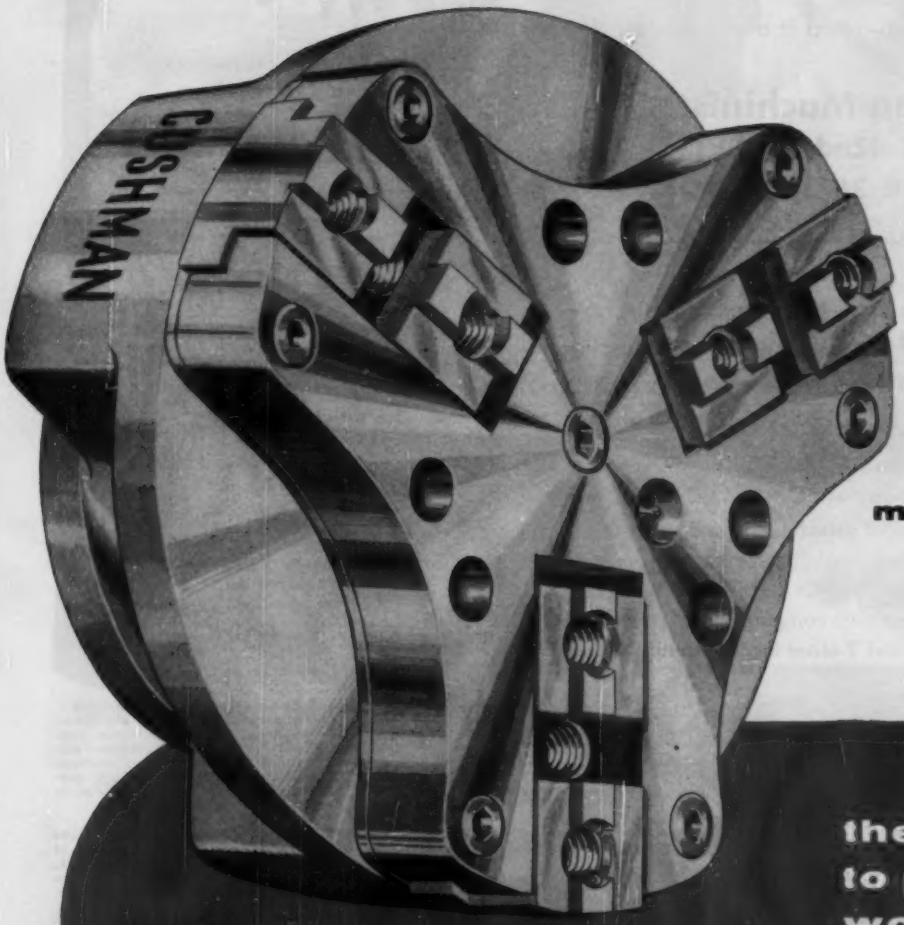
An **O**sborn **B**rushing **A**nalyst is ready to survey your plant for similar results. There is no obligation. Write *The Osborn Manufacturing Company, Dept. C-60, Cleveland 14, Ohio.*

Write TODAY for the new 100-page Osborn Catalog 210-C.

Osborn Brushes

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES • BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

CUSHMAN CHUCKS



high speed aluminum body air operated chucks

matching air cylinders

the answer to precision workholding

CUSHMAN CHUCKS GIVE CHUCK-ABILITY—The ability to SPEED your work . . . ELIMINATE fatigue . . . IMPROVE your products . . . and REDUCE your costs . . . through design and selection of the right workholding devices.

CUSHMAN CHUCKS . . .
a Product of American Quality,
Labor and Materials

SOLD THROUGH YOUR
INDUSTRIAL DISTRIBUTOR

THE CUSHMAN CHUCK COMPANY

Hartford 2, Connecticut

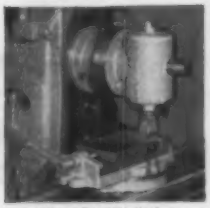
CUSHMAN
the
CHUCKMAN
CHUCKS AND ACCESSORIES
Exclusively
SINCE 1882

SC887A

WHAT'S AHEAD?...see Page 2

Yes, American Machinist's "Chips" column on page 2 of each issue forecasts coming events in future issues, and also points up behind-the-scenes stories of how current articles are gathered and written. Form the "Chips" habit—read it every issue.

American Machinist
330 W. 42nd STREET
NEW YORK 36, NEW YORK



Heavy Duty Vertical Milling Attachment

Heavy Duty Offset Vertical Milling Attachment

Universal Milling Attachment

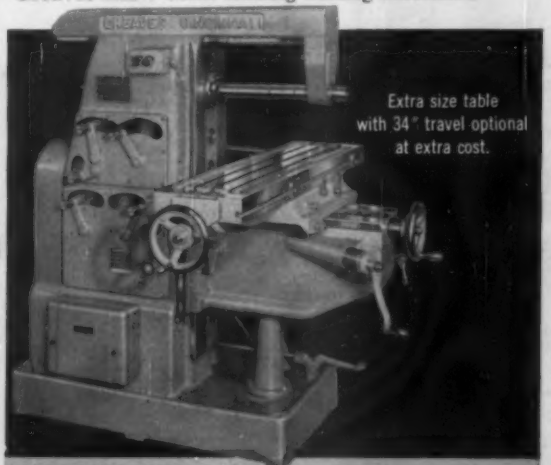
Toolmakers Overarm

Heavy duty attachments increase versatility of dependable, low-cost

GREAVES MILLS

"THE MOST MILL FOR THE LEAST MONEY"

A full line of attachments and accessories offer outstanding flexibility for all types of milling operations . . . with GREAVES MILLS. Make your own comparison of 22 specifications of Greaves and 7 other leading milling machines.



Extra size table with 34" travel optional at extra cost.

Send coupon for FREE Comparison Chart and detailed descriptive literature on easy-to-use attachments.

GREAVES MACHINE TOOL CO.
2100 Eastern Avenue, Cincinnati 2, Ohio

Send Comparison Chart. I will make my own comparison of GREAVES MILLS with other makes.
Send information on Attachments and Accessories for GREAVES MILLS.

NAME _____ TITLE _____
FIRM _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

Answers to hundreds of METALWORKING questions—complete in one EASY-TO-USE volume

What leading magazines say about this book:

Automatic Machining: "Offers quick answers to metalworking problems of a practical nature"

Design News: "Digests vast amount of original source material otherwise difficult to obtain even when one knows where to look."

Welding Journal: "Valuable aid to machinists, designers, draftsmen, and engineers."

Automotive Industries: "Storehouse of useful tables and formulas, plus . . . methods, materials, and equipment."

THE NEW
AMERICAN MACHINIST'S HANDBOOK

Edited by RUPERT LE GRAND
Senior Associate Editor, American Machinist
1579 pages, 5⅛ x 8
774 illustrations, $11.00
Payable in installments

JUST think of being able to find the answer—the dependable answer—to almost any question—quickly—layouts, feeds, speeds, tools, jigs, fixtures, materials, standards, tolerances—any detail of machine shop or drafting room practice. The New American Machinist's Handbook presents this kind of information, in the form in which you can best understand and use it.

Here is a treasury of the kind of machine shop information that will help every man to save time and avoid trouble in his own work, to go ahead on any job with confidence, and to improve his skill, reputation, and earning power.

See for yourself what this modern metalworking guide can do for you. Look the book over for 10 days free. Pay on easy monthly terms if you decide to keep it.

SEND THIS FREE EXAMINATION COUPON

McGraw-Hill Book Co., Dept. FA-7-29-57
327 W. 41 St., N.Y.C. 36

Send me Le Grand's the NEW AMERICAN MACHINIST'S HANDBOOK for 10 days' examination on approval. If satisfactory I will send (check one) ☐ $11, plus few cents for delivery costs in 10 days and $2 a month until $11 is paid, or ☐ full purchase price of book. (We pay delivery cost if remittance accompanies this coupon. Same examination and return privilege.)

(Print)
Name _____
Address _____
City _____ Zone _____ State _____
Company _____
Position _____
For price and terms outside U.S., write McGraw-Hill Int'l., N.Y.C. FA-7-29-57

for every wheel that turns in industry

Lubricating oils, cutting oils, multi-purpose greases, greases for spraying . . . whatever your needs, Atlantic has the lubricant to help you. Atlantic lubricants insure maximum lubricating performance at low cost for every job in the plant . . . for every wheel that turns in industry.

For lubricating products that fit your specific needs, or for expert assistance with your lubricating problems, write or wire any of these Atlantic offices.

Philadelphia
260 South Broad Street

Providence, R. I.
430 Hospital Trust Building

Reading, Pa.
First and Penn Aves.

Charlotte, N. C.
1112 South Boulevard

Pittsburgh, Pa.
Chamber of Commerce Building

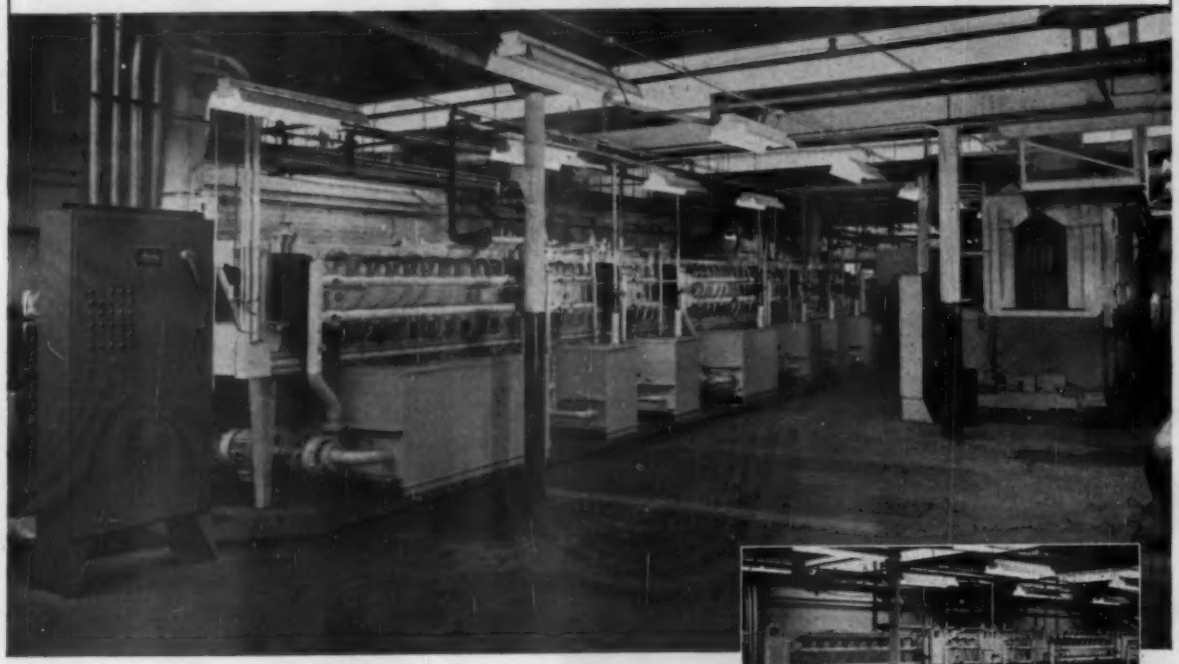
Syracuse, N. Y.
Salina and Genesee Sts.

Atlantic Refining Co. of Brazil Rio de Janeiro, Brazil

ATLANTIC

LUBRICANTS · WAXES
PROCESS PRODUCTS

First in the Nation



1. 75-foot continuous treatment strip machine, left, and automatic Spra Bonderite, right, in Parker's new customer service lab.

Now, for the first time in the industry, Parker Rust Proof Company brings you a way to test surface treatment of metals on a production line basis, *before* you install surface treatment equipment in your plant.

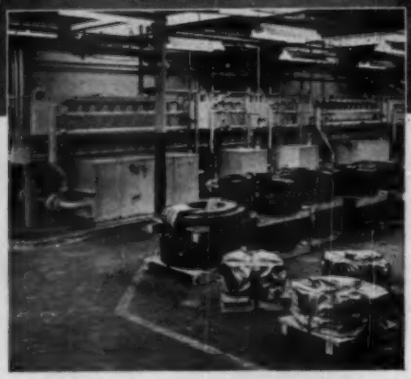
You can save time, trouble and money by making use of the extensive research facilities of Parker's unique new customer service laboratory. It's a research lab with production line equipment, run like a production line.

This automated lab can treat sample stock by the ton. It is equipped to prepare samples and conduct tests involving all of Parker's varied and outstanding surface treatments of metals.

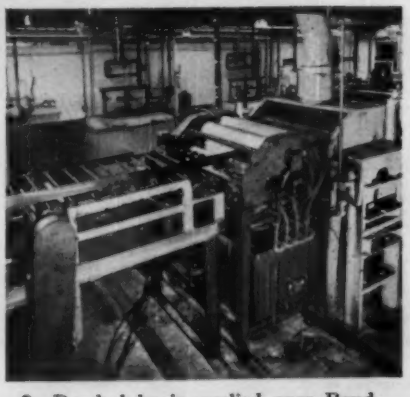
If you have a metal surface treatment problem, you are cordially invited to make use of this new testing service. Just contact your nearest Parker representative, or write or call Parker Rust Proof Company.

PARKER
RUST PROOF COMPANY
2196 E. MILWAUKEE, DETROIT 11, MICHIGAN

Since 1914—leader in the field



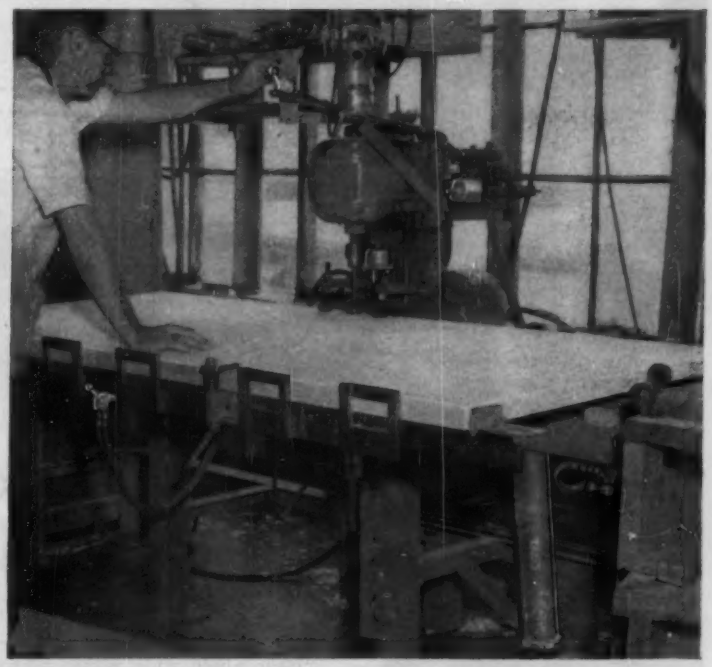
2. Tons of steel in coils await treatment in the strip and sheet treating machine.



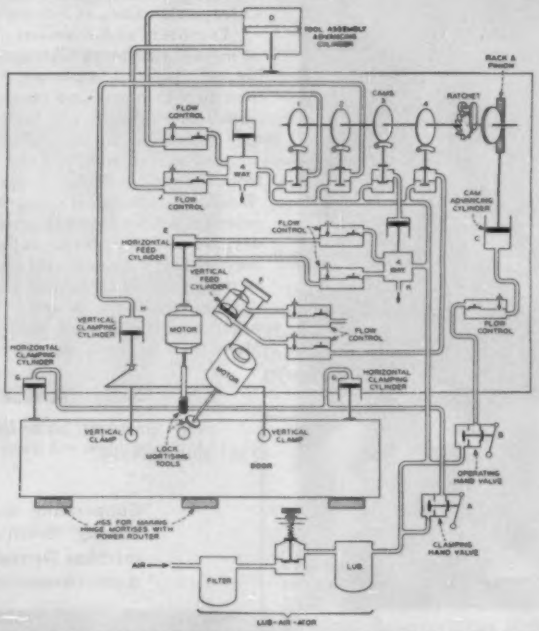
3. Bonderlube is applied over Bonderite treatment for cold forming sample. Roller coating section at end of strip machine is interchangeable.

***Progress** in plan-it-yourself air systems:*

You can use Schrader Air Products to produce faster at a lower cost



A revolutionary building trend—pre-hung doors—means tremendous savings. Doors and frames are mortised for lock sets and hinges, assembled. This schematic shows how the door is prepared.



Air is a *natural* for many operations in processing, handling and other multi-step production . . . even to mortising doors in the woodworking field. Every day air's speed, simplicity and safety are effecting new production records.

Here's an example:

At a prominent Western woodworking company, Schrader Air Products are used on the door-mortising machine to clamp work in place, advance programming cam, and actuate all tool feeds. The machines work with extreme precision and the speed and economy of the operation are spectacular.

Chances are that Schrader Air Products can do the same for you no matter *what* you do. Take advantage of Schrader engineering facilities, available upon request, to assist you in planning for the best use of air in your production, and selection of the *right* Schrader Products to fit your needs.

Information is available by writing directly to us . . . and our Distributors are conveniently located for fast delivery.

Schrader
a division of **SCOVILL**

QUALITY AIR CONTROL PRODUCTS

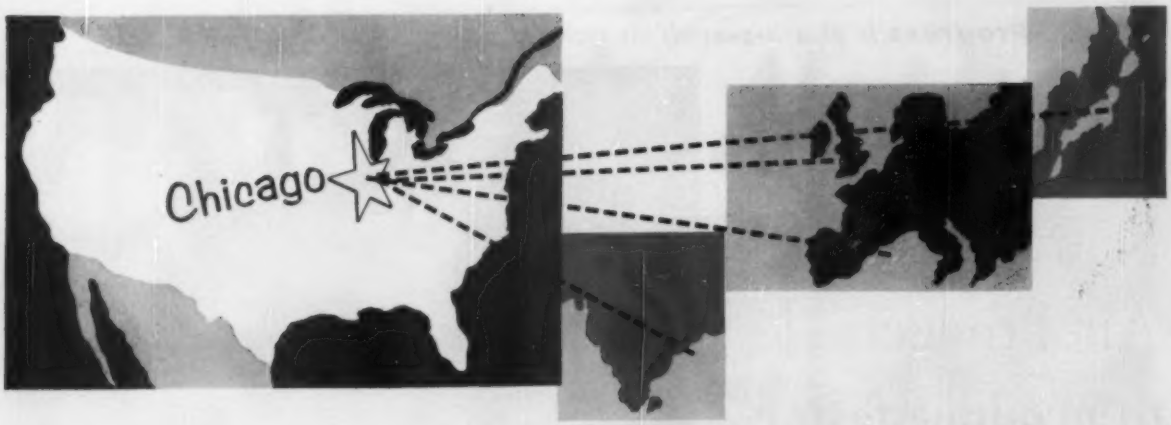
A. SCHRADER'S SON • Division of Scovill Mfg. Co., Inc.
462 Vanderbilt Avenue, Brooklyn 38, N. Y.

Please send latest informative booklets which show Schrader's complete line of products.

Name_____ Title_____

Company_____

Address_____



39th National Metal Exposition
2nd World Metallurgical Congress

In the whole, wide, wonderful world of metals, for one fast-moving, action-packed week, Chicago will be world headquarters for metal men.

From wherever metals are made . . . from wherever metals are used . . . from all parts of the United States and around the free world, the responsible men of metals will move into Chicago the week of November 4, 1957.

Engineers and scientists . . . executives and production experts . . . the responsible men of metals will be in Chicago to see the 39th National Metal Exposition — the best, the biggest, the most important Metal Show of them all. Hundreds of manufacturers will place their best products and operating processes and equipment on display in the vast International Amphitheatre and New Exposition Halls. This great Exposition will make show history . . . will make metals history.

And this is only half the story. World authorities on metals . . . outstanding scientists from the United States . . . again, the responsible men of metals will be speakers at the 2nd World Metallurgical Congress and at the 39th National Metal Congress. Technical and practical sessions will begin on Saturday, November 2, and run continuously through Friday, November 8. Never before has such an array of metals engineering and scientific talent been assembled on so vast a scale . . . engineering developments of world-wide impact will be presented for all to hear and digest and discuss.

You will want to attend this great event, this world metals week in Chicago. Your organization may well wish to send management, engineering and sales representatives. Make the first move now — write for hotel reservation forms.

AMERICAN SOCIETY FOR METALS

The Engineering Society for the Metal Industry

7301 Euclid Avenue — Cleveland 3, Ohio

Cooperating Societies: Metals Division, American Institute of Mining, Metallurgical and Petroleum Engineers . . . the Society for Non Destructive Testing . . . the Industrial Heating Equipment Association.

Exhibit Space Available

Hundreds of manufacturers have reserved Metal Show space, but there are good locations still available in the vast new exposition halls of the International Amphitheatre. If the metalproducing or metalworking industries are your market, don't miss this show — write for display information now.

SCIAKY

HELPS PUT PROFIT
INTO MANUFACTURING

How Massey-Harris-Ferguson Achieves Mass Production Economy on Short Runs

Among manufacturers whose production requirements for any given part are limited, resistance welding is often regarded as an impractical method of fastening. They agree it is fine for mass production where tooling costs and setup time can be spread out over tens of thousands of parts. But for them, the cost of tooling and fixturing anything but the simplest assemblies would be uneconomical.

The Cost Research Department of Massey-Harris-Ferguson, as part of a program to reduce manufacturing costs, undertook an investigation of resistance welding. Under the direction of Mr. E. E. Hart, the investigation emphatically proved the economy and dependability of the process for a wide range of limited production assemblies.

Simplification of setup is key

The Cost Research Department reasoned that the key to the entire problem depended entirely on minimizing setup time, complete simplification of tooling and fixturing and positive dependability and consistency of the fabricating method. Mr. Hart was convinced proper resistance welding techniques would satisfy all these requirements. Subsequent developments and testing proved him right.

How the problem was solved

Basic tooling and fixturing was built right into the welder. (See Figs. 1 and 2.) The various assemblies required only the simplest tooling. Individual tooling for any assembly seldom cost as much as $75 per welding setup.

Setup time for any assembly was reduced to an average of 30 minutes. The performance of the welders themselves was carefully studied and recorded. Machine control setup for any assembly was reduced to a simple matter of the briefest reference to graphs.

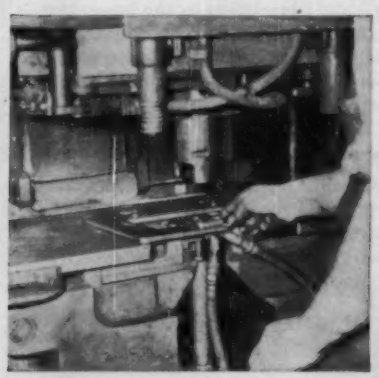


Fig. 1 Close-up of simple tooling required for a baler pick-up crank assembly.

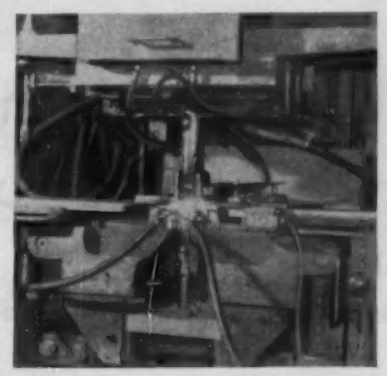


Fig. 2 Note universal fixturing table and simple dies used for welding a yoke assembly.

Cost reductions achieved

The large number of assemblies fabricated by resistance welding include many structural members. Castings, forgings and arc welded assemblies have been replaced with resistance welded assemblies of standard sheet or bar stock and screw machine products.

The cost of the resistance welded part averages 10 to 40% less than similar arc welded parts. The savings in time of the welding operation itself averages 60 to 90%. Castings and forgings suffer in comparison, with savings of over a dollar per unit not unusual.

Fig. 3 Typical assemblies resistance welded on Sciaky equipment at M-H-F.

Quality welding essential

The success of such a program requires that the welders be capable of producing consistently high quality welds with maximum ease of control setup. Sciaky patented three phase welders easily meet these requirements.

Detailed information available

Two bulletins are available giving more complete information on the Massey-Harris-Ferguson program. "Resistance Welding at Work," Vol. 5, No. 1 (16 pages), gives data, including cost reductions, on 28 different M-H-F assemblies. An engineering report on "Design Standards" (48 pages) gives full technical data on the eight basic weld types employed. Copies of either or both bulletins are available on request.

Write today, mentioning the information you would like to receive. There is no obligation. Sciaky Bros., Inc., 4933 W. 67th St., Chicago 38, Ill. POrtsmouth 7-5600.

DO YOU HAVE A RESEARCH PROBLEM?

Facilities of the Sciaky Research Division at Los Angeles, California, are available for contract research to answer resistance welding problems. Housed in a 15,000 sq. ft. building, these facilities include an experienced engineering staff, a complete range of the most advanced resistance welding machines including the largest in the world and a laboratory equipped for metallography, chemistry, electronics, photography and testing as applied to resistance welding. Write for further information and ask for the 20 page Research Division brochure.

For 201 "hot" ideas on machine tooling... jigs and fixtures... press tools...

See Section C—Tooling—in your AM Annual Production Planbook and Buyers' Guide Issue

New York—If you're stymied for **tooling** ideas to do the job "right" there's plenty of help handy in your American Machinist Production Planbook and Buyers' Guide Issue. Section C is crammed with over 200 tooling facts and information items —lathe tooling, carbide and ceramic tools, grinding wheels, plastic dies and tooling, press tools, and welding, brazing and heat-treating fixtures. They are tooling "Nuggests," core ideas extracted from articles published in regular issues of American Machinist. Issue dates and page numbers are shown if you wish to refer to the full text. Many of the original photos, sketches and diagrams are republished in the "Nuggets" section of your Planbook.

Did you know . . .?

For a checklist of modern ideas on tooling, see pages C-12 and C-13, "Tooling Developments to Watch," a highly useful, idea-sparking feature of your Production Planbook. Then, starting on page C-24, is a list of Free Literature offered by tooling manufacturers to enable you to get product information quickly and easily.

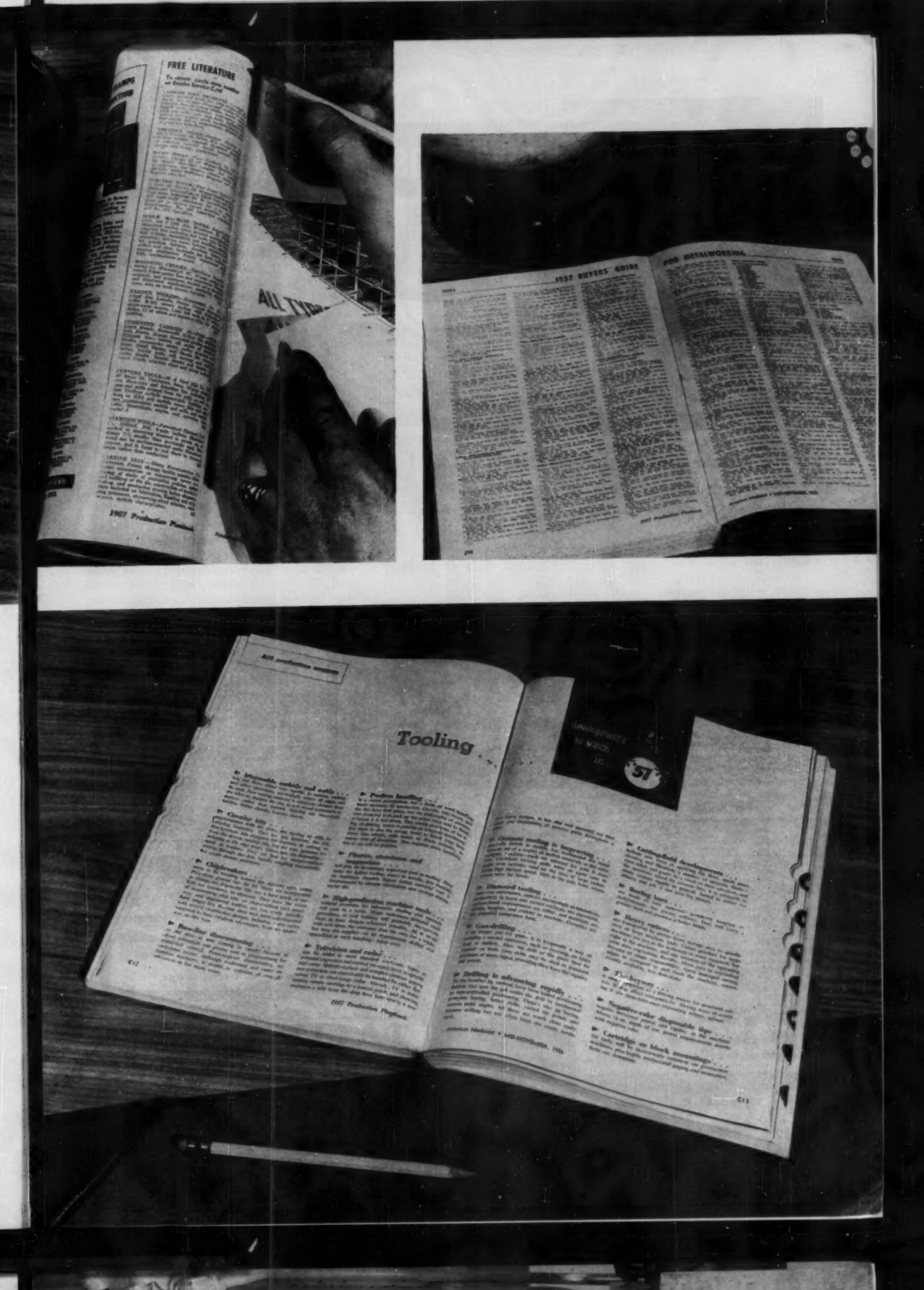
Section J, a complete classified Buyers' Guide, lists sources of supply for all the machine tools, tooling, other production equipment, materials, parts and components, and supplies—everything you need to put your ideas to work.

Vendors names shown in bold face type are advertisers in the issue, and page numbers of their advertisements are provided to make easier your job of getting product information.

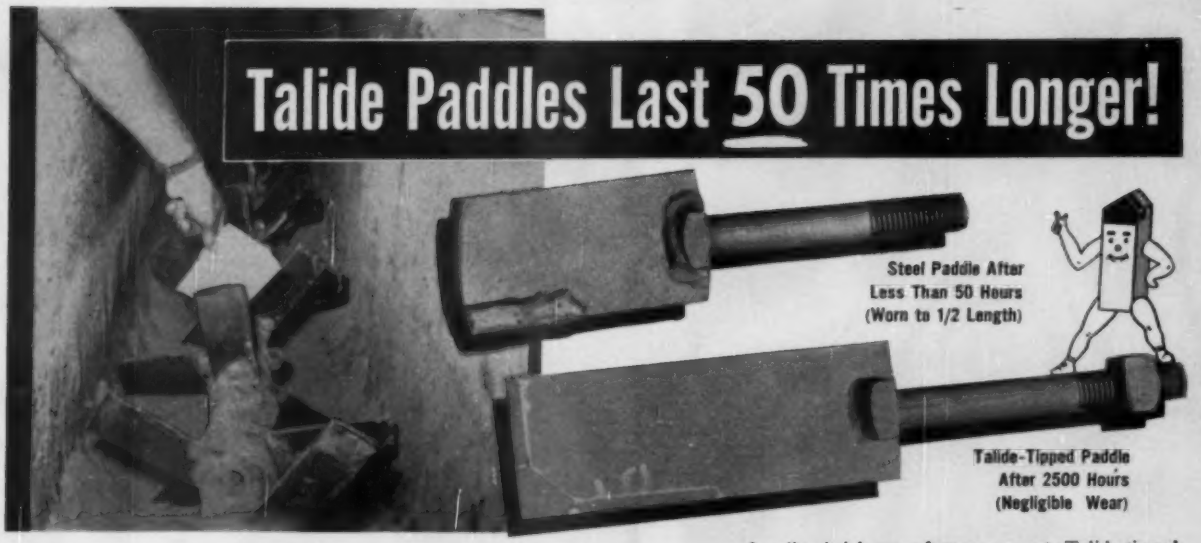
Coming Mid-September, 1957

Your 1958 edition of American Machinist's Production Planbook and Buyers' Guide Issue is now in preparation for publication in Mid-September, 1957.

It will again provide you with an easy-to-use, thumb-indexed reference showing "How-to-do-it," "What-to-do-it-with," and "Where-to-buy-it" in a single, manageable, year 'round issue.


FREE LITERATURE
1967 Production Planbook
1957 BUYERS GUIDE
FOR METALWORKING
All production engineers
Tooling
Developments to watch in
'57

Talide Paddles Last 50 Times Longer!



HARDEST MAN-MADE METAL!

TALIDE METAL, a tungsten carbide of superior quality, is harder, stronger, and more resistant to abrasion than any other metal. Properly applied, it gives superior service on applications where wear, heat, strain, and shock are destructive to other metals.

- **ABRASION RESISTANCE**— Up to 100 times that of steel.
- **COMPRESSIVE STRENGTH**— Higher than all melted, cast or forged metals and alloys.
- **RESISTANCE TO DEFORMATION**— 2 to 3 times greater than steel.
- **HEAT RESISTANCE**— Resists oxidation and thermal shock up to 1500° F.
- **THERMAL EXPANSION**— Less than half the rate of steel, "creep" is negligible.
- **FRICTIONAL RESISTANCE**— Lower than steel, non-galling, "slippery" properties higher.

ALL TALIDE METAL grades are made in latest type vacuum electric furnaces by precision methods under rigid control. A wide variety of shapes and sizes can be supplied—up to 25" in diameter, 100" in length, and 5000 pounds by weight. Parts can be supplied to any grit finish required down to one micro-inch. The physical properties of the most commonly used grades are listed below. Other grades are available for specialized applications.

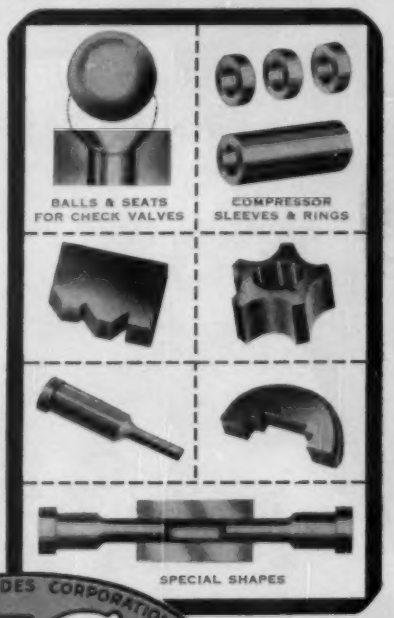
PHYSICAL PROPERTIES OF TALIDE METAL (P. S. I.)

Application	Operation	Talide Grade	Rockwell "A" Hardness	Specific Gravity (Density)	Transverse Rupture Strength	Compressive Strength	Co-Efficient of Thermal Expansion	Modulus of Elasticity (Deflection)
WEAR SURFACE	No Shock	C-91	91.8	14.90	235,000	710,000	3.00x10-6	91,000,000
	Light Shock	C-89	91.0	14.75	265,000	670,000	3.65x10-6	84,000,000
	Medium Shock	C-88	89.5	14.55	295,000	635,000	4.00x10-6	80,000,000
IMPACT	Light	C-85	88.4	14.25	315,000	600,000	3.75x10-6	77,000,000
	Medium	C-80	87.0	13.85	335,000	550,000	4.50x10-6	74,000,000
	Heavy	C-75	85.0	13.15	355,000	500,000	5.00x10-6	70,000,000

Note: Hardness values may vary plus or minus .2 to .3 on individual lots.

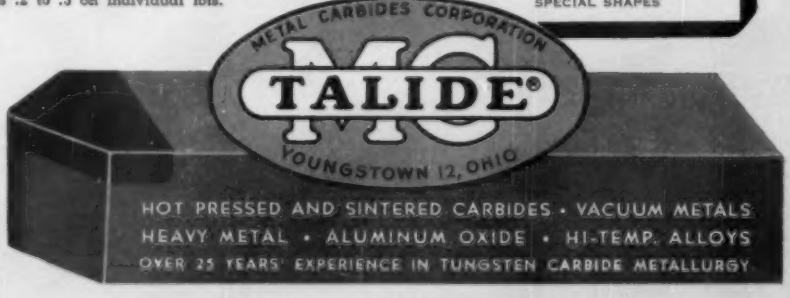
Leading brick manufacturer reports Talide-tipped pug mill paddles have outlasted 50 sets of hard-faced steel paddles to date—and are still in use. Operation involves mixing abrasive ceramic, clay and brick compositions.

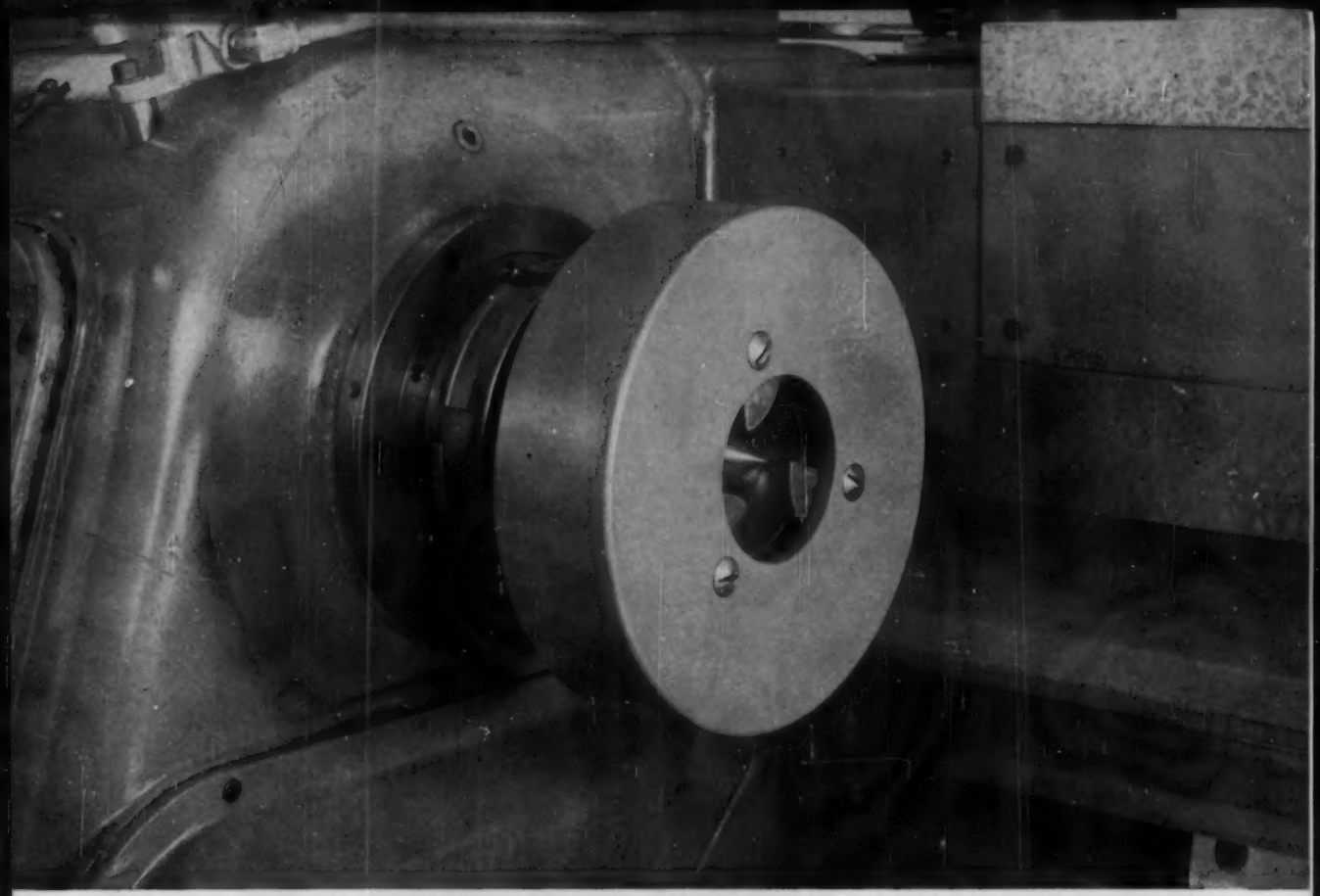
TALIDE METAL is saving industry millions of dollars annually by wear-proofing vital parts on machine tools, presses, pumps, compressors and other types of processing equipment used in the steel, oil, chemical, plastic, auto, rubber, textile, glass, ceramic, mining and metalworking industry.



Send for new 76-page catalog 56-G or ask for sales engineer to call.

Metal Carbides Corporation
Youngstown 12, Ohio


METAL CARBIDES CORPORATION
MC
TALIDE®
YOUNGSTOWN 12, OHIO
HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY



This time saver will quickly pay for itself in your plant

For turning between centers, give your present lathes the time-saving advantages of the same +GF+ Work Driver used on the world famous George Fischer Lathes.

It clamps and unclamps with a slight turn of the hood. Clamps rough or smooth blanks and out-of-round forgings evenly. Automatically matches clamping force to cutting pressure. No fussing with driving dogs, no time-wasting hand wrenching.

Five models of the +GF+ Work Driver give you diameter capacities of 1/4" to 8-1/16"— each model drives a wide range of diameters. Write for the +GF+ Work Driver Bulletin, which gives full information, specifications, and applications. Write Dept. 107.

Best way of all to drive out-of-round forgings and other work pieces. Jaws are held in a floating ring which fits them to the work piece and drives with evenly distributed force.

A half-turn of the hood engages or releases the jaws — no wrench needed. Jaws can easily be set to drive in either direction. Hood is easily removed for changes to jaws accepting different diameters.

Skinner Chuck Company is national distributor for the +GF+ Work Driver. Sales are handled through Industrial Distributors, Machinery Dealers, and Machine Tool Builders.

SKINNER CHUCKS

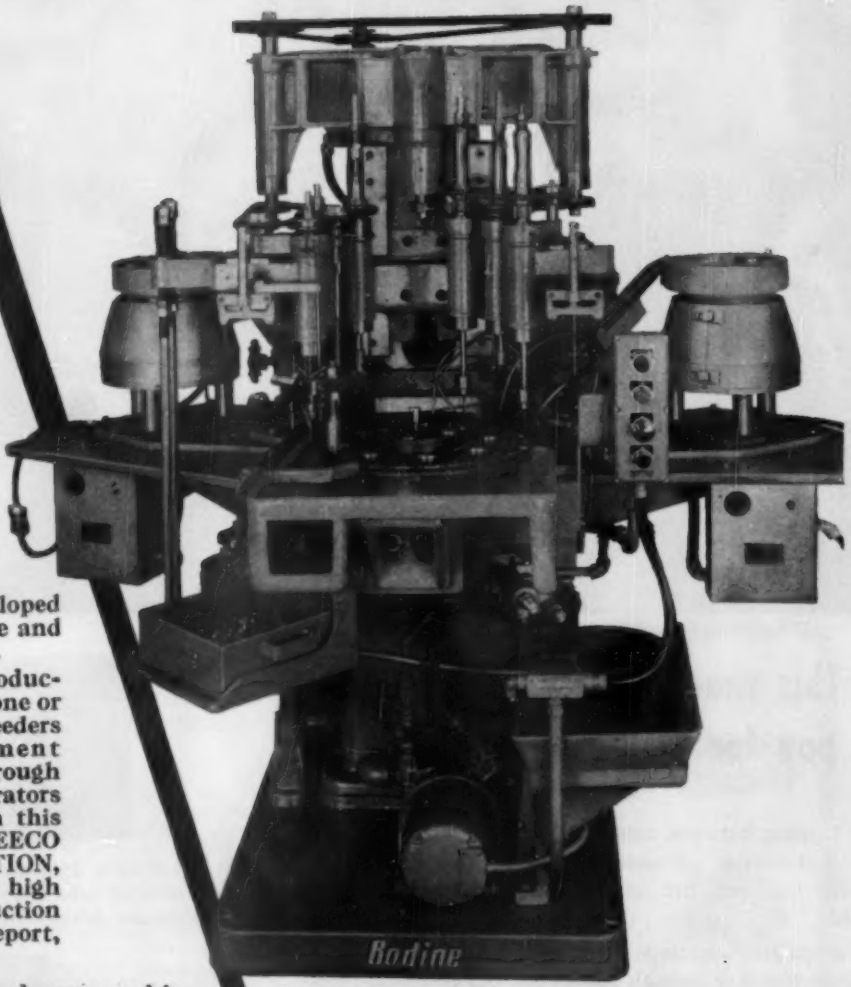
THE SKINNER CHUCK COMPANY

ESTABLISHED 1887

NEW BRITAIN, CONNECTICUT

Production Equipment Produces

MORE with PEECO



Vibratory Parts Feeders play an ever increasing important roll in the industrial drama "to produce more for less." PEECO's leadership in the field of vibratory feeders and their helpfulness to industry in developed techniques that save time and money, are unchallenged.

Just as in the case of production lines, the placing of one or more PEECO developed feeders on production equipment effects great savings through the elimination of operators and/or operator time. In this field now being served by PEECO is the BODINE CORPORATION, the established name for high volume automatic production and assembly, of Bridgeport, Connecticut.

If you want to produce more, send for bulletin #563 and ask for the name of the PEECO representative in your area.

DEVELOPED *PEECO* FEEDERS
NOW* included on production equipment by *Bodine

This standard Bodine Model 4120, dial type, automatic tapping and screw inserting machine, automatically hopper feeds, transfers and drives two screws at a time and automatically captivates them. This machine normally operates to produce 2750 pieces per 50 minute hour.

THE WORLD'S LARGEST
EXCLUSIVE MANUFACTURER
OF VIBRATORY PARTS FEEDERS

Peeco

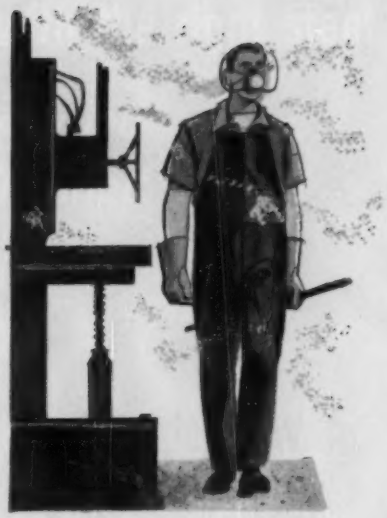
PERRY EQUIPMENT & ENGINEERING CO.

ERIE, PA. • • • DIVISION OF AUTOMATION DEVICES, INC.

Give your Workers BOTH

Respiratory and Facial Protection

This Easy, Practical Way!



AO R2000 RESPIRATOR with R18 FACE SHIELD

The R2000 Respirator you know about — it's industry's preferred single cartridge respirator that gives you eight respirators in one basic face piece to handle a multitude of dusts, fumes and mists — singly and in combination.

The R18 is a highly adaptable face shield specifically designed for wear with the R2000. Light in weight, durable, easy to attach, it protects eyes and upper face against frontal attack of flying particles. Window is plastic or cellulose acetate .020″ thick. Outer edges are protected by vinyl plastic binding for longer shield life. Shield may be worn over regular prescription glasses.

Recommended wherever comfortable DOUBLE protection is desired such as in light chipping, light grinding, light scraping, polishing, painting. Your nearest American Optical Safety Products Representative can supply you.

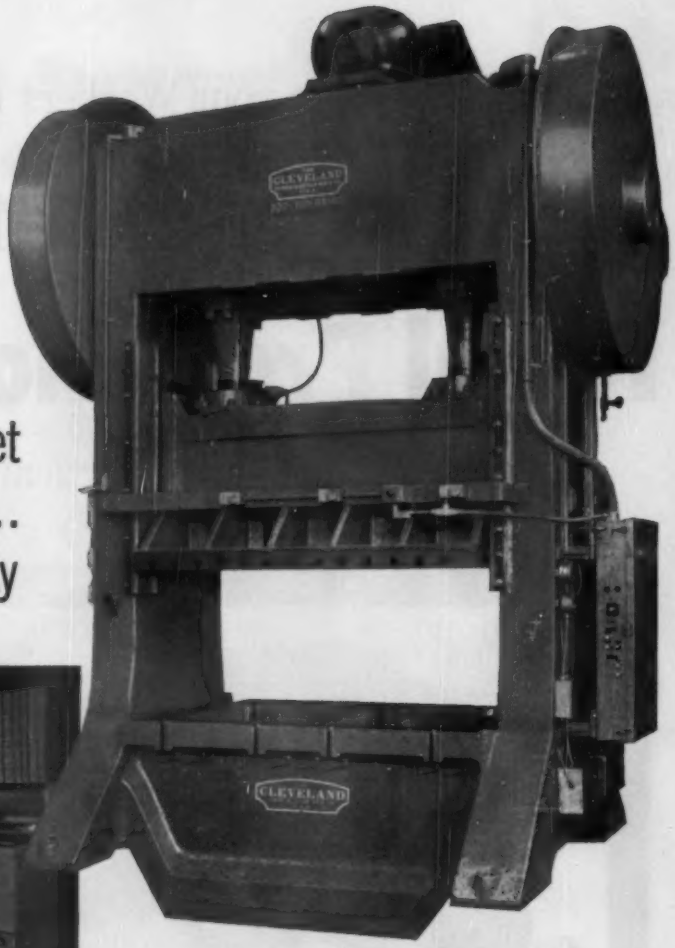
Always insist on AO Trademarked Safety Products

American Optical
COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS
BRANCHES IN PRINCIPAL CITIES

With stampings you get construction economy... design flexibility

Courtesy of Youngstown Kitchens of American-Standard, Warren, Ohio



New **Cleveland Presses** give you low cost stampings.

The many advantages of stampings are readily apparent as you look at today's modern kitchens. For stampings have opened the door to more graceful product designs . . . improved finishes. Weight has often been reduced with no sacrifice of strength. All at lower unit cost.

New Cleveland Presses improve stamping quality . . . keep production costs down. Simplified, rugged construction of every Cleveland Press gives you reserve capacity for added safety and dependable performance. Sturdy frames strengthen and minimize deflection under rated capacity, assure stamping accuracy . . . assure long die life. Patented Cleveland Clutch assures operating economy . . . low-cost maintenance.

Each of the 11 types of Cleveland Presses is available in a wide range of sizes designed to meet your exacting requirements . . . to assure low stamping costs, faster production. For big jobs or small ones, call or write today for complete information to The CLEVELAND Punch & Shear Works Co., East 40th and St. Clair Ave., Cleveland 14, Ohio.

Offices at: New York • Chicago • Detroit • Philadelphia • East Lansing • Cincinnati

MACHINING PERFECTION always starts with the right steel

Pick exactly the right steel for any job from J & L's complete cold finished line

"Increased valve cap production 31% with J & L 1113 Bessemer steel"

This valve cap for drums requires considerable surface machining, drilling and tapping. Comparison test with the previously used open hearth leaded steel shows J&L "1113" leaded Bessemer steel upped production 31% . . . permitted change from a 15-second to a 10⅓-second cycle. Surface finish is smoother. J&L leaded steels assure you higher cutting speeds, longer tool life. Get facts from your distributor or write to Jones & Laughlin, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

J&L STEEL

Jones & Laughlin

. . . a great name in steel

MACHINING ALUMINUM

OPERATOR REPORTS

This report is one of a series by Deo Blott, Technical Specialist, Kaiser Aluminum & Chemical Sales, Inc.

How to choose the correct alloy for aluminum screw machine parts

To SELECT the most suitable alloy for screw machine products, first determine the qualities needed in the part. Where superior workability is required, 2011-T3 should be used, especially if replacing different materials. The other aluminum alloys should be used where design characteristics are a determining factor.

Alloy 2011-T3: Superior Workability

The most common alloy for screw machine parts is 2011-T3. This alloy has copper as the principal alloying element. Lead and bismuth are added to speed machining, produce a better finish on the part, and to create finely divided, easy to handle chips. Addition of these alloying elements provides aluminum with those desirable machining qualities in much the same manner as lead improves brasses and bronzes and as sulphur helps steel in similar cutting operations.

2011-T3 is widely used for many commercial screw machine parts including parts for clocks, appliances, electronic equipment, etc.

Alloy 2017-T4: Greater Strength

The second widely used aluminum alloy is 2017-T4. This alloy has copper, magnesium and manganese as the principal alloying elements. Because of its high strength characteristics and increased properties over 2011-T3, it is recommended for those parts requiring greater strength either as single units or in assemblies. This alloy is often selected for products requiring deep drilling operations.

Alloy 2024-T4: The "Aircraft Alloy"

Another common screw machine alloy is 2024-T4. Copper, magnesium and manganese are the principal alloy-

	ALUMINUM ALLOYS				BRASS
	2011-T3	2017-T4	2024-T4	6061-T6	FREE CUTTING
Mechanical Properties (Typical)					
Tensile strength, psi	55,000	62,000	68,000	45,000	58,000
Yield strength, psi	43,000	40,000	47,000	40,000	42,000
Elongation, % in 2"	15	22	19	17	18
Ultimate shear strength, psi	32,000	38,000	41,000	30,000	34,000
Endurance limit, psi	18,000	38,000	20,000	14,000	—
Brinell hardness	95	105	120	95	116
Physical Properties					
Electrical Conductivity, % IACS	40	30	30	40	25.5
Coefficient of Thermal Expansion, (68-212F)	12.7×10^{6}	13.1×10^{6}	12.9×10^{6}	13.1×10^{6}	11.4×10^{6}
Density, lbs. per cu. in.	0.102	0.101	0.100	0.098	0.307
Modulus of Elasticity, psi	10.2×10^{6}	10.5×10^{6}	10.6	10.0	15.0
Suggested S.F.P.M.					
Round	700-1100	450-550	450-550	350-450	700-1000
Hexagonal	450-550	350-400	350-400	300-400	450-550
Square	350-450	250-300	250-300	200-300	350-450

ing elements. It is generally known as the "aircraft alloy" and has higher properties than either 2011-T3 or 2017-T4. Probably the largest single use for this alloy at present is for aircraft fittings. Then, too, because of its relatively higher shear strength, it is widely used for all types of threaded fasteners.

Alloy 6061-T6: Highly Versatile

The fourth common screw machine alloy is 6061-T6 with magnesium, silicon, chromium, and copper as the principal alloying elements. This alloy is the most versatile of the heat-treatable aluminum alloys. It has superior corrosion resistant qualities and has an excellent finish when anodized. Also it handles better when subsequent brazing, soldering, and fusion welding operations must be performed.

* * * * * *

To help you machine aluminum most effectively, Mr. Deo Blott will go to your shop and recommend practices proved best by operators experienced in aluminum.

Mr. Blott has been machining aluminum on rod automatics since 1934, and is an acknowledged authority on using aluminum in screw machine operations.

For immediate attention to your request for this advisory service, or for detailed information on any phase of machining aluminum, contact Kaiser Aluminum or see your Kaiser Aluminum distributor.

* * * * * *

Parts Conversions Demonstrate Machinability and Savings

Aluminum meets the one big operator requirement: *machinability*. For example, the four parts shown below were all converted from brass to Kaiser Aluminum with little or no change in machining speed and setting.

String Tie End
28% saving when converted from brass to aluminum*

Speedometer Cable Connector
39% saving when converted from brass to aluminum*

Adjusting Nut
21% saving when converted from brass to aluminum*

Clock Part
36% saving when converted from brass to aluminum*

Aluminum also meets the principal management requirement: *savings*. The savings shown in these examples—21 to 39 per cent—are typical of the economies made possible by converting to Kaiser Aluminum.

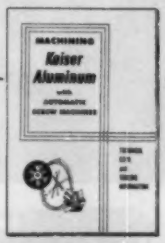
Kaiser Aluminum & Chemical Sales, Inc., *General Sales Office*, Palmolive Bldg., Chicago 11, Illinois; *Executive Office*, Kaiser Bldg., Oakland 12, California.

*Savings based on metal prices current when the conversion was made.

SEND COUPON FOR THIS HELPFUL SCREW MACHINE INFORMATION

Kaiser Aluminum

THE BRIGHT STAR OF METALS



This up-to-date information "Machining Kaiser Aluminum With Automatic Screw Machines" is yours FREE!

Helpful 52-page booklet on using aluminum with automatic screw machines. Clearly written, contains valuable technical data and tooling information. Send coupon today for your free copy!

KAISER ALUMINUM & CHEMICAL CORPORATION
Box AM7, Technical Publications Department
919 N. Michigan Ave., Chicago 11, Illinois

Gentlemen:

Please send me, without obligation, the free booklet, "Machining Kaiser Aluminum With Automatic Screw Machines."

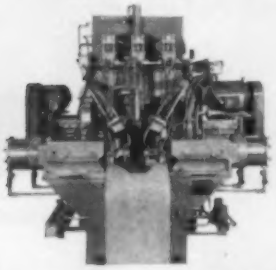
NAME_____

ADDRESS_____

CITY_____ STATE_____

COMPANY_____

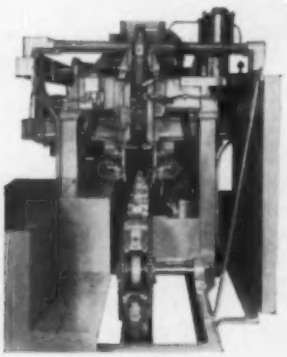
Entry end of line



Federal

PACKAGED PRODUCTION LINE

Automates Pedal Bracket Manufacture for Dodge!



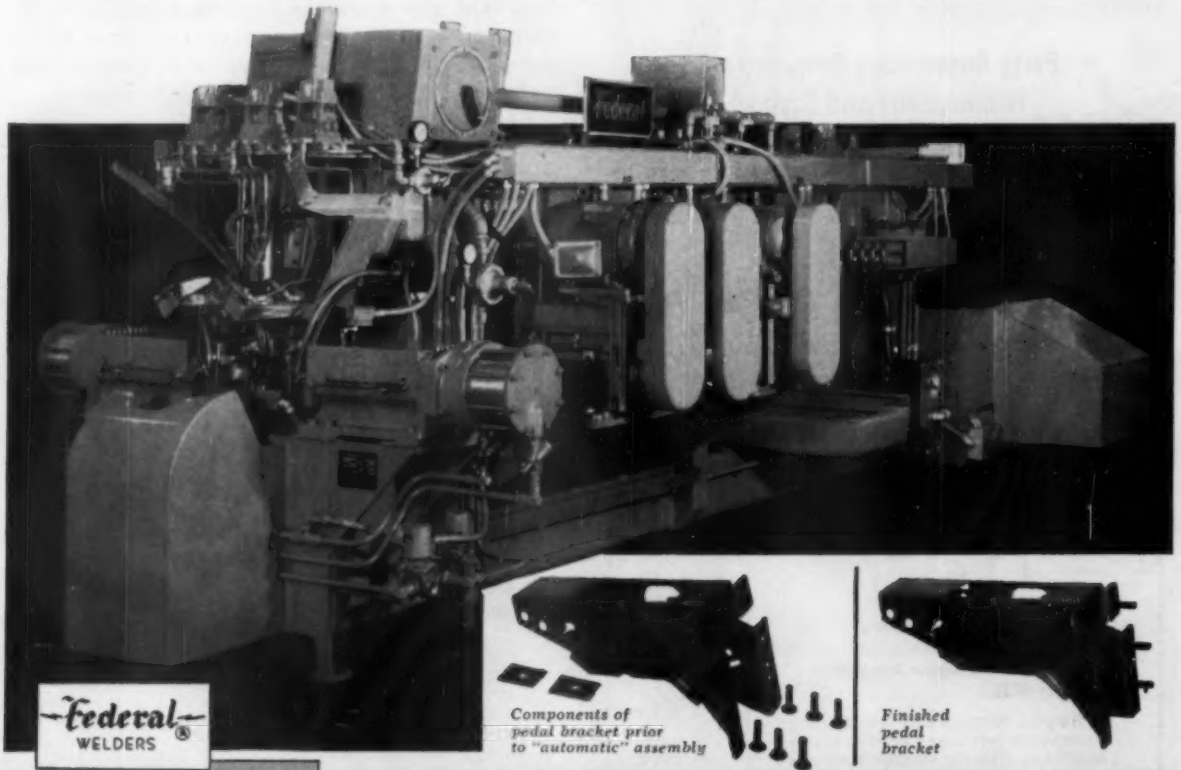
Exit end of line

SINGLE LINE AUTOMATICALLY FEEDS, SPOT FACES, REAMS, DE-BURRS, WELDS TO SPEED PRODUCTION, CONTROL UNIFORMITY OF PEDAL PART

The Dodge Division of the Chrysler Corporation recently set into operation a single Federal machine that performs manufacturing functions normally requiring many separate pieces of equipment. In the fabrication of automotive pedal brackets this Federal "Packaged Production Line" was made to feed and weld two pads to the bracket, spot face one pad, ream and de-burr holes in each pad, feed and weld six mounting bolts and eject the finished piece at a rate of 775 units per hour.

The combining of several manufacturing operations into one has many natural advantages. It means one source responsibility, reduced floor space, and handling requirements, equipment economies and greater product uniformity.

Don't overlook these benefits—talk with Federal—a pioneer in the development and manufacture of "Packaged Production Lines."



Components of pedal bracket prior to "automatic" assembly

Finished pedal bracket

Federal WELDERS

Warco PRESSES

The Federal Machine and Welder Company

WARREN, OHIO

225

Answers to hundreds of METALWORKING questions —on planning and production— COMPLETE IN ONE EASY-TO-USE VOLUME

What leading magazines say about this book

AUTOMATIC MACHINING: "Offers quick answers to metalworking problems of a practical nature."

DESIGN NEWS: "Digests essentials of a vast amount of original source material that would otherwise prove difficult to obtain even when one knows where to look."

WELDING JOURNAL: "A valuable aid to machinists, designers, draftsmen, and engineers."

MECHANICAL ENGINEERING: "Emphasis throughout is on up-to-dateness, comprehensiveness, and practicality."

AUTOMOTIVE INDUSTRIES: "Provides a storehouse of useful tables and formulas, plus a convenient-sized encyclopedia of up-to-the-minute information on modern metalwoking methods, material, and equipment."

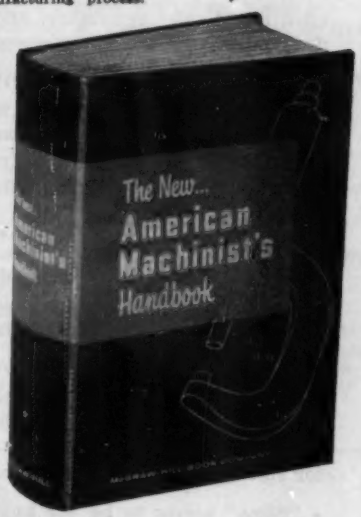
MANAGEMENT DIGEST: "Completely new and truly up to date."

PRODUCT ENGINEERING: "As a reference handbook, as a volume for self-study, as a practical summary of man's up-to-date methods of working metal, this complete revision of Colvin's and Stanley's original handbook should prove valuable to all those active in the manufacturing process."

The NEW AMERICAN MACHINIST'S HANDBOOK

Edited by RUPERT LE GRAND
Senior Associate Editor, American Machinist
1579 pages, 5¾ x 8,
774 illustrations, $11.00

- **80% REWRITTEN**
- **REARRANGED TO GIVE MORE FACTS—EASIER REFERENCE**
- **FULLY UP TO DATE**



45 SECTIONS

Part I. MACHINING METHODS—1. Broaches and Broaching. 2. Drills and Drilling. 3. Files and Burrs. 4. Gears, Splines, and Serrations. 5. Grinding, Honing, Lapping, and Superfinishing. 6. Milling and Milling Cutters. 7. Planing and Shaping. 8. Reamers and Reaming. 9. Saws and Sawing. 10. Threading Processes and Thread Systems. 11. Taps and Tapping. 12. Turning and Boring. 13. Screw-machine Work.

II. METAL-FORMING METHODS—14. Metal Spinning. 15. Presswerking and Cold-roll Forming. 16. Forging, Upsetting, and Cold Heading. 17. Cold Working of Metals. 18. Die Casting. 19. Babbitting of Bearings.

III. ASSEMBLY METHODS—20. Arc Welding and Surfacing. 21. Gas Welding and Oxygen Cutting. 22. Resistance Welding. 23. Brazing. 24. Soldering and Soft Solders.

IV. MATERIALS—25. Steels and Irons. 26. Non-ferrous Metals. 27. Heat-treatment of Metals. 28. Gages, Tolerances, and Weights of Metal Products.

V. FINISHING OF METALS—29. Metal-cleaning Processes. 30. Plating and Metal Coating. 31. Paint and Painting. 32. Electrolytic and Chemical Finishes of Metals.

VI. INSPECTION—33. Limits, Fits, and Tolerances. 34. Measuring and Gaging Equipment. 35. Tapers and Dovetails.

VII. FASTENING DEVICES — 36. Bolts, Screws, Rivets, and Washers. 37. Keys and Pins.

VIII. TOOL ENGINEERING AND DRAFTING PRACTICE—38. Jig and Fixture Details. 39. Drafting Practice and Engineering. 40. Surface Finish.

IX. MACHINE-TOOL STANDARDS — 41. Standard Machine-tool Elements. 42. Machine-tool Inspection.

X. POWER-TRANSMISSION EQUIPMENT—43. Chain, V-belts, and Motors.

XI. MATHEMATICS AND TABLES—44. Mathematics. 45 Reference Tables.

Here is a treasury of the kind of machine shop information that will help every man to save time and avoid trouble in his own work, to go ahead on any job with confidence, and to improve his skill, reputation, and earning power. And, overall, the shop benefits, too, in time saved in set-up and operation, in reduced delays and spoilage, and in improved results.

Just think of being able to find the answer—the dependable answer — to almost any question — quickly — layouts, feeds, speeds, tools, jigs, fixtures, materials, standards, tolerances—any detail of machine shop or drawing room practice. The New American Machinist's Handbook presents this kind of information, in the form in which you can best understand and use it.

As the English journal, **Machinery Lloyd** says, "So vast in its scope and wide in its coverage that it is difficult to do it justice in a short space." Get the best measure of the book's worth for you from the book itself. Send for it, without obligation, for free examination.

SEE THESE BOOKS FOR 10 DAYS FREE — JUST SEND THIS COUPON

INDUSTRIAL ENGINEERING HANDBOOK

Puts a wealth of dependable information at the fingertips of industrial engineers and management men. Covers all aspects, from materials handling, job evaluation, work measurement, and plant facilities and design, to automation, and linear programming. Factual and how-to-do-it in approach. Prepared by over 70 specialists. H. B. Maynard, Editor-in-Chief. 1512 pages, illustrations, $17.50

HANDBOOK OF FASTENING AND JOINING OF METAL PARTS

Ready reference guide helps in selecting best methods for specific jobs of fastening, joining, and connecting metal parts for assembly. Covers such methods as screw thread and nuts, welding, collars, couplings, keys, brazing, soldering, resins, adhesives, etc. An outstanding feature is the easy-to-follow 200-page section in picture and caption style. By V. H. Laughner and A. D. Hargan. 622 pages, over 3,500 illustrations, $15.00

McGRAW-HILL BOOK CO., INC., Dept. FAM-7-29-57
321 W. 41st St., New York 36, N. Y.

Send me book(s) checked below for 10 days' examination on approval. In 10 days I will pay for book(s) I keep, plus few cents for delivery costs, and return unwanted book(s) postpaid. (We pay delivery costs if remittance is sent with this coupon; same return privilege.)

- ☐ Le Grand—New Amer. Mach. Handbook, $11.00
- ☐ Maynard—Industrial Eng. Handbook, $17.50
- ☐ Laughner & Hargan—Hdbk. of Fasten. & Join. Metal Pts., $15.00

(Print)
Name .....
Address .....
City & Zone ..... State .....
Company .....
Position .....

For prices & terms outside U. S. write McGraw-Hill Intl., N. Y. C.

FAM-7-29-57

Gaging . . .

the Surplus Machinery Market

• **What about the hike in the price of steel**—will it have any appreciable effect on the used machinery business? Most dealers report no effects one way or the other so far, but one big Midwestern outfit has been adding to its inventories, anticipating that the boost in steel prices will boost new machine tool prices proportionately. And, this dealer thinks, that will drive more customers into the used machinery market.

But will it? Pricing today is one of the major problems of the surplus machinery market. It's felt in more than one quarter that while customers have had their eye on used machinery for quite some time, they simply refuse to pay prevailing prices—World War II machinery at 70% of new prices, for example.

The dealers themselves are quick to condemn the current practice of asking very high prices for late-model lathes, mills and radials—even in the face of declining demand. Says one, "This is bringing on a lot of sales resistance, and some price adjustments will undoubtedly have to be made soon."

• **We talked recently with MDNA's new president,** Elmer Pfeil of Elmer W Pfeil Inc, Cleveland, who says some Association members found June to be a "very strong month," but that such optimism had been far outweighed by reports of "very slow" business. Mr. Pfeil, for one, looks for a pickup by mid-August. Cleveland area dealers report that business is "definitely in the dumps" just now—although most of them admit that the decline is seasonal.

One problem this summer, aside from seasonal factors, is that demand is centered on hard-to-find items like late-model standard millers, lathes, grinders and shears.

One dealer, who says his big problem is buying, not selling, is finding it particularly tough to get the kinds of machines that are in top demand today. He claims he could have sold 18 machines to a customer who was setting up a new lathe line—but he had to settle for six. Just couldn't find the rest.

• **"Slow" seems to be the key word for business in Chicago,** although there are some exceptions. On an average, sales for the first six months of this year are down about 10% from year-ago levels. Several dealers say that sales thus far in the third quarter are practically nil, and that they'll stay that way all summer.

Predictions for the rest of the year? Here are three: (1) "Don't expect a pickup until September or October—then it won't be a runaway like 1956 either," (2) "Sales will pick up in September or October and we're adding to inventories in anticipation," and (3) "Our sales total for the first six months was down 11% from last year, but business will pick up in the latter part of the third quarter, and in the fourth quarter."

• **Three factors are responsible for a business lull** out on the West Coast—aircraft industry cutbacks, vacation periods in customer plants, and a widespread sheet-metal workers' strike. If the strike continues for any length of time, Los Angeles dealers predict, it will have a depressing effect on the used machinery market. Otherwise, the West Coast business picture is about the same as it has been for several months, insofar as supply and demand is concerned—although a few small dealers say their volume has increased 10-12% in the last month.

S&S has Everything in machine tools

NEW... USED... REBUILT...

ALWAYS 2500 TOOLS IN STOCK

FOR SALE OR RENT

TERMS UP TO TEN YEARS

UNUSUAL MACHINES

VERTICAL BORING:
7"—8"—10"—12"—14"—16" Bullard Mult-Au-Matics—1943
35" Sellers—Turret Type—1941
30" Bullard Man-Au-Trol—1946

HORIZ. BORING:
10" Bar Breda—1954
5" & 6" Giddings & Lewis—1945
2"—3"—4"—5" Supermill Table Type—New

GRINDERS:
100" Frauenthal Double Head Vertical—1943
Cincinnati Projecta Form—1945
(3) Cincinnati Tool & Cutter—1948
6" x 15", 6" x 18", 8" x 60", 12" x 45"
J & L Thread—1947

UPSETTERS:
9" National-Air Clutch—W. T. 500,000 #5—1942

GEAR PLANER:
144" Gleason Spur & Internal—1943

DOUBLE HOUSING PLANERS:
15' x 10' x 36', 12' x 10' x 32', 10' x 8' x 20'—1943

LATHES:
156" Swing x 50' CC Niles—Available "Rebuilt"

VERTICAL MILLS:
#10 Portland—32"x122" Table—1957
#6 Supermill Knee Type—67" Longit. Travel—1957

JIG MILLS:
3B DeVlieg—1952

BROACHES:
24 Ton x 90" Stroke—LaPointe #SRV-15-90—1952

PRESSES:
Cleveland Toggle—200 Ton—48"x48" "Bed-20"& 14" Stke.—1952
Bliss Hydro Dynamic—72" Stke.—1945
Beatty #11B—350 Ton—1945

TURRETS:
Warner & Swasey 1AC Chucker—1948

SHAPERS:
Rockford Hydraulic—24"

SAW:
Do All 36HP Hydro Feed—1951

ATTENTION DEALERS
We cooperate fully with you in serving your customers. Our complete buying, selling and rebuilding facilities are at your disposal.

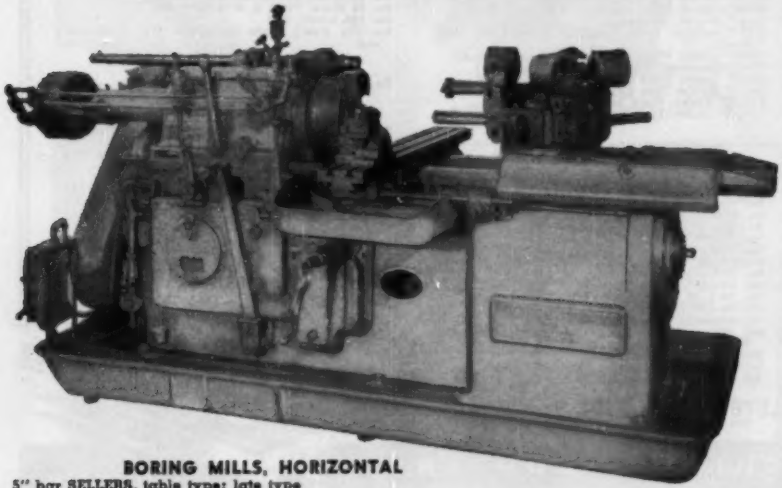
Write Today For Complete S & S Catalog

S&S MACHINERY COMPANY
145 53rd ST. BROOKLYN 32, N. Y.
PHONE · HYACINTH 2-7400 CABLE: SANDSTOOLS
WEST COAST | 6945 BANDINI BOULEVARD Los Angeles 22, RAymond 3-9231

MOREY *for half a century*

Quality • Reliability • Value

POTTER & JOHNSTON
4D AUTOMATIC CHUCKING MACHINES



BORING MILLS, HORIZONTAL

5" bar SELLERS, table type; late type
4" bar SELLERS, table type; late type
3" bar UNIVERSAL; late type

RADIAL DRILLS

AMERICAN 4' arm 11" col. Triple Purpose
AMERICAN 7' arm 16" col. Triple Purpose
CARLTON 6' arm 19" col. Plain; low hung drive
CIN. BICKFORD 2½' arm 7½" col. "Super-Service" H.S.; late.
CIN. BICKFORD 4' arm 9" col. "Super-Service"
CIN. BICKFORD 4' arm 11" col. Pl; oil groove base.
CIN. BICKFORD 6' arm 15" col. Univ.; oil groove base.
FOSDICK 6' arm 17" col; H.S.; late type.

GEAR EQUIPMENT—GLEASON

#1 Surface Hardener; late type.
3" Straight Bevel Gear Generator; 4-7/16" P.D., 8 D.P.; late.
3" Spiral Bevel Gear Generator; 4-7/16" P/D.; 12 D.P.; late.
#8 Straight Bevel "Revacycle"; .450 D.P.; late type.
#7 Hypoid Cutter Sharpener; max. dia. 6" R or L hand; late.
#7A Gear Generators; late type
11" Straight Bevel Gear Generator; M.D.
12" Straight Bevel Gear Generator; fully automatic.
#12 Tool Sharpener; late type
12" Spiral Bevel Cutter Sharpener; max. dia. 16" late.
#16 Hypoid Gear Generator; 2½ D.P.; Production Type; late.
15" Sprial Cutter Grinder; motor drive.
15" Spiral Bevel Gear Generator; max. dia. 18¼"; 3 D.P.; M.D.
25" Spiral Bevel Gear Generator; max. dia. 34"; 1½ D.P.; M.D.
24" Straight Bevel Gear Planer; max. dia. 28"; 1½ D.P.; M.D.
37" Spur & Straight Bevel Gear Planer; max. dia. 43"; 1 D.P.; M.D.
54" Spur & Straight Bevel Gear Planer; max. dia. 60"; 3½ D.P.; M.D.

GEAR EQUIPMENT—HOBBING

BARBER COLMAN Type A; cap. 12"x12"; 3 D.P.; with differential; late.
BARBER COLMAN Type S Auto.; 1" dia., brass 24 D.P., steel 32 D.P.; late.
BARBER COLMAN Type T, 12"x12" cap., 3 D.P.; with differential; late.
BARBER-COLMAN Type V; 8-10, Vertical
BARBER COLMAN #17, cap. 8"; 2½ D.P.; 5¼" hole thru spindle; M.D.
GOULD & EBERHARDT #8H Univ.; cap. 12"; 4 D.P.; heavy duty; M.D.
GOULD & COLMAN #12H Univ.
GOULD & EBERHARDT #24h Univ.; cap. 27"; 3½ D.P.; late type.
GOULD & EBERHARDT #36H Univ.; extended hob spindle.
LEES BRADNER 7A-8 Spdle. Rotary Hobbers.
NEWARK #5 for helical worm wheels & spur gears.

PLANERS

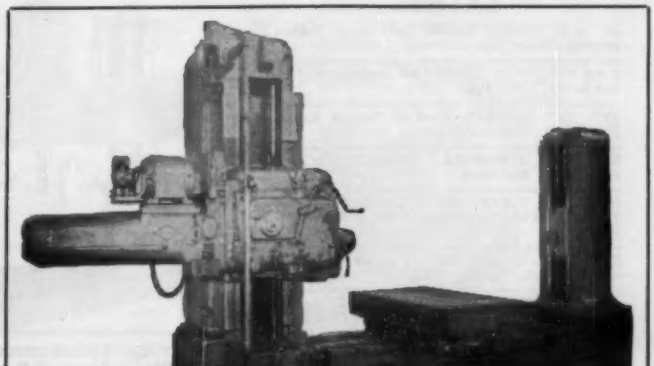
AMERICAN 48"x48"x10' double housing.
NBP 36"x36"x14' double housing.
NBP 72"x72"x30' double housing.
DETRICK & HARVEY 48"x48"x16' with hydraulic table feed with oil gear unit, with hydraulic clapper box lifts.
GRAY 48"x48"x10' double housing "Maximum Service"
LIBERTY 144"x76"x48' Openside
SELLERS 48"x48"x7' double housing.

SHAPERS & SLOTTERS

GOULD & EBERHARDT 32" "Invincible"; Horiz.; M.D.
HENDEY 12" Univ. Horiz.; high speed; late type.
NEWTON 15" Ver. Slotter; motor drive.
NBP 30" Slotter; crank type; late.
PRATT & WHITNEY 6" & 10" Ver. Shaper; M.D.
ROCKFORD 36" Openside Shaper; Hyd.; late type.
STEPTOE 14" Horiz. Shaper; M.D.; late type.

MILLING MACHINES—THREAD

EXCELLO #33 Thread Grinder; helix angle of wheel 20° in either direction.
EXCELLO #35-L Univ. Precision Thread Grinder; late type.
FELLOWS #4T Thread Generator, cap. 4"x18" cc; 5 D.P.; late.
HALL Style B Planetary Mill & Thread Mill; max. dia. 6"; late.
HANSON & WHITNEY 8"x16" cc Univ.; late type.
LANDIS #6 Thread Grinder; 12"x24".
LEES BRADNER Model LT—6"x72" cc; late.
LEES BRADNER Model HT—12"x24" cc; late.
MOREY 12"x30"; 12"x120"; 12"x160"; 12"x190" cc; late.
PRATT & WHITNEY Model 1804 4½"x12" cc; late.
PRATT & WHITNEY 6"x132" cc; all geared head.
WALTHAM—max. center distance 12".



SELLERS 5" bar, table type, precision high speed horizontal boring mill

A thousand and one varieties for your every Machine Tool need!

MOREY *...for machine tools!*

MOREY MACHINERY CO., INC.
Manufacturers • Merchants • Distributors
383 LAFAYETTE STREET • NEW YORK 3, N.Y.
ALGONQUIN 4-6560 • CABLE ADDRESS: WOODWORK N. Y.

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY—THE MARK OF DEPENDABILITY

CYLINDER GRINDERS

No. 73 Heald Airplane Cylinder Grinder, m.d., new
Model FG Micro Cylinder Grinder, m.d.
No. 50 Heald, m.d., 1944

DISC GRINDERS

No. 131 Besly, m.d.
No. 4 Gardner Disc Grinder, m.d.
7½ H.P. U.S. Elec. Tool Co., m.d., new
14A Gardner, m.d.
No. 180—30" cap. Gardner, m.d., latest
No. 121 Hanchett Prod. Face Grinder, m.d.
No. 124 Mattison Auto. Stroke Grinding & Polishing Machine, m.d.

SURFACE GRINDERS

No. 16 Blanchard Rotary, m.d.
No. 16A-2 Blanchard Auto. Rotary, m.d.
No. 33 Abrasive, m.d.
14" Pratt & Whitney Vertical, m.d.
14" Pratt & Whitney Model M 1640 Vertical, m.d.
No. A-1—6" Arter Surface Grinder
No. 22—12" Heald Rotary, m.d.
No. 25-A—24" Heald Rotary, m.d.
No. 25-A—30" Heald Rotary, m.d.
No. 2 Brown & Sharpe, m.d.
#300-60 Hanchett Vertical Spindle, m.d.
78" Type NT Rogers Knife Grinder, m.d.
18" wide, 24" under wheel, 120" table Mattison, m.d.
Model F, 8x10x18" Thompson Hydraulic Horizontal Wheel, m.d.
Model 84A—61" Bridgeport Hydraulic Face, m.d.

PLAIN CYLINDRICAL GRINDERS

5x18" Ott Plain Cylindrical, m.d.
No. 5 Brown & Sharpe Plain Cylindrical, m.d., 1942
6x15" Cincinnati Plain Hydraulic, m.d.
6x18" Cincinnati Model EA, m.d.
6x18" Cincinnati Model ER, Plain Hydraulic, m.d., Filmatic Spindle
6x18" Landis Type C Hydraulic, m.d., late
6x18" Norton Plain Grinder, m.d.
10x18" Cincinnati Plain Hydraulic, model ER, m.d., Filmatic Spindle, 1945
10x18" Cincinnati Model EA, m.d.
10x18" Norton Type C, m.d., latest
10x36" Cincinnati Hydraulic, m.d.
10x36" Norton Type C, m.d.
10x72" Landis, m.d.
12x36" Landis Plain Self-Contained, m.d.
12x96" Landis Self-Contained, m.d.
14x52" Norton, motorized
16x72" centers Type C Norton Semi-Auto., Hydraulic
16x72" Landis Plain Self-Contained, single m.d.
16x96" Cincinnati Plain Cylindrical, m.d.
18x36" Landis Type C, m.d.
18x72" Norton Type C, mechanical, m.d.
20x120" Landis Plain Self-Contained, m.d.
25"x72" Landis Type C, m.d.

INTERNAL GRINDERS

Type 1G 103 Greeby, m.d.
No. 5 Bryant, m.d., latest
Model 5Y Bryant, m.d.
No. 16—18" Bryant m.d., hydraulic Hole Grinder
No. 16CR16 Bryant, m.d., latest
No. 16—22" Bryant, m.d., latest
No. 16—36" Bryant, m.d., latest
No. 16-A—20" Bryant, m.d.
No. 24—36" Bryant Hole & Face Type, m.d., late
No. 24P—20" Bryant, m.d.
No. 24—21" Bryant, m.d.
No. 24-L-36 Bryant, m.d., late
No. 24-LW-36 Bryant, m.d., late
No. 44 Heald Facing Type Borematic, m.d.
No. 640—19" Van Norman Automatic Oscillating Radius, m.d., latest
No. 70A Heald, m.d., latest
No. 72A Heald Sizematic, "Duplex", m.d.
No. 72A Heald Gagematic, m.d.
No. 72A3 Heald Full Universal, m.d.
No. 72A3 Heald Gagematic, m.d.
No. 72A3 Heald Sizematic, m.d.
No. 72A3 Heald Plain, m.d.
No. 72A5 Heald Sizematic, m.d.
No. 72A5 Heald Plain, m.d.
No. 73 Heald Airplane, m.d., latest, new
No. 74 Heald, m.d.
No. 75A Heald, m.d., latest
No. 72 Heald, Plain Long Base, m.d., 1941
No. 78 Heald Centerless Cylinder, m.d.
No. 81 Heald Gagematic, Sizematic, m.d.
No. 81 Heald Plain & Sizematic, m.d.
No. 106 Rivett, m.d.
No. 172 Heald Plain Adjustable Gap Hydraulic, m.d.

THREAD GRINDERS

No. 33 Excello Precision, m.d.

SNAG GRINDERS

Type No. 50—7½ H.P. Standard Elec. Tool Co. Double End, m.d.
25 H.P. U.S. Elec. Co., Heavy Duty Double End, m.d.

UNIVERSAL GRINDERS

10x24" Landis Type C, m.d.
12x48" Norton, m.d., latest
14x48" Landis Universal
14x36" Norton, m.d.
14x72" Norton Universal Hydraulic, m.d.

KEYSEATERS

No. 3 Niles Cotter & Keyseat Milling Machine, m.d.
Morton, m.d., thru reversing gear box

SEND FOR COMPLETE STOCK LIST

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio MElrose 1-1241 "TWX" CI-174
CABLE ADDRESS EMCO

BUY FROM STOCK Telephone BAKER 5-5887

FALK MACHINERY COMPANY

10 WARD ST. ROCHESTER 5 N. Y.

Every Item Guaranteed as Represented

LATHES

24" x 12' BOYE & EMMES Grd. Head, Timken Bearing. Taper Attachment.

4 DE POTTER & JOHNSTON Automatic Turret Lathe, Late Type.

24", 36" BULLARD Vertical Turret Lathe, Turret Hd., Side Hd., M.D.

No. 2, 3, 4, 6 WARNER & SWASEY Univ. Turret Lathes, Bar Feed.

No. 3, No. 7 BARDONS & OLIVER Universal Turret Lathes, Preselector, Bar & Chucking. Late.

No. 1L, 2L, 3L GISHOLT Univ. Turret Lathe, Cross Sliding Turret, M.D.

DRILLING MACHINES

28" BARNES Upright Drill Press No. 242 M.D. Box Column, Power Feed.

3', 5', 6' CINCINNATI-BICKFORD Radial.

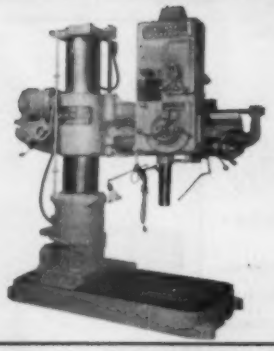
MILLS

No. 3 Cincinnati HSDT Vertical Mill 1944

No. 56-90 CINCINNATI Duplex Hydromatic Mill, Late Type.

No. 0-8 CINCINNATI Horizontal & Vertical Prod. Mills, M.D.

No. 34-36, 45-48, 48" Cincinnati Duplex Mills. Late Type.



3'x13" Col. CINCI-BICKFORD "Super Service" Radial Drill. Motor on Arm.

No. 2HL KEARNEY & TRECKER Horiz. Mill, M.D., Late Type.

No. 2 BROWN & SHARPE Vert. Mill, Light Type. Swivel Head, M.D. Late.

No. 2, No. 3, 4 CINCINNATI HSDT Horiz. Mills, Vert. Heads Extra Table Travel, 1945.

No. 1-14 KENT-OWENS Hydraulic Prod. Mills M.D., Late Type.

No. 4 CINCINNATI Hi Power Vert. Mill, 1942.

PRESSES

No. 6 BLISS Straight Side Press Double Crank 135 Tons Cap., Motor Driven.

3W WATERBURY FARREL Hi-Speed Blanking, 60 Tons Cap., 1½" Stroke, Reeves Drive.

No. 18, 19, 20, 21 Bliss O.B.I. Press.

GRINDERS

28" x 12' centers, FARREL Traveling Table Type Roll Grinder, New in 1942. Excellent condition.

6" x 18" NORTON Hydraulic Horizontal Surface Grinder, Permanent Magnetic Chuck, Coolant System, Late Type.

6" x 10" x 48" NORTON Hyd. Horiz. Surf. Grinder, M.D.

4T SELLERS Tool Grinder, MD, Late Type.

30" INGERSOLL Face Mill Cutter Grinder, M.D. Late Type.

6" x 18" LANDIS Type "C" M.D. Hyd., Cylindrical Grinder, Serial #29196.

MISCELLANEOUS

18 KW SCIENTIFIC ELECTRIC Induction Heater, Tube Type.

No. 13 BROWN & SHARPE Univ. Tool & Cutter Grinder, Late Type.

No. 175 SCHMIDT M.D. Hyd. Power Marking Machine, Late Type.

No. 3, 5 MITTS & MERRILL, No. 5 Davis Keyseaters, M.D.

No. 194 BARNES Vertical Hone, 4" Capacity, 12" Stroke, M.D.

20" ROCKFORD Model SA Hydraulic Vertical Slotter, New 1953.

8" CLEVELAND Model A Automatic Screw Machine. Late Type.

No. 9 MARVEL Heavy-Duty Hack Saw 10" x 10' Cap. M.D. Late Type.

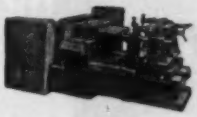
6' x 10 ga. Parker Power Squaring Shear, M.D. Late Type.

OVER 1000 MACHINE TOOLS AVAILABLE IN STOCK . . . SEND US YOUR INQUIRIES

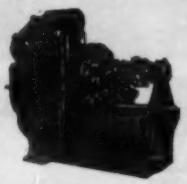
LAURENS

means dependable, technical knowledge, and courteous service to plants all over the World. We guarantee EVERY machine we sell. This means that we are doubly careful about what we ship to you.

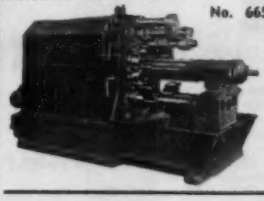
No. 521 Heald Single End Borematic, new about 1950, 16" table travel, like new.



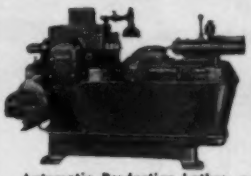
No. 122 Heald Double End Borematic, serial number 35198, new in 1954, practically new. With one head on each bridge and hydraulic cross sliding fixture.



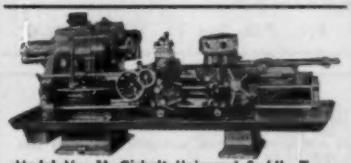
#76H Baird 6-Spindle, 7" capacity Automatic Chucker, serial 473, latest style, new 1947. Fully equipped and tooled.



No. 665 New Britain Gridly Chucker 6-Spindle, 6½" capacity, new 1945, serial 29479. tooling. Similar to picture.



#10 Sundstrand Automatic Production Lathes, serials 10-490, 10-534 and 10-538. Late machines. No. 12 Sundstrand Automatic Production Lathes, new 1949, serials 82-678 and 82-662.

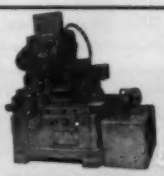


Model No. 1L Gisholt Universal Saddle Type Turret Lathe, serial 632-35, 1942, complete bar feeding mechanism and collet chuck.

12" 8-Spindle Bullard, Model "D" Mult-Au-Matic, Serial 19002, new 1942, double index, power chucking. With four plain slides and two double compound slides.

Fellows Gear Shapers: Models 61, 61A, 75 and 715 Fellows Gear Shapers. These are of the latest type, equipped, standard, excellent condition throughout. Ask for detailed quotations.

No. 72H Gould & Eberhardt Universal Gear Hobber, for spur and helical gears. New in middle 1930's, with outboard support, change gears, motor. Max. dia. of gear without outboard support 78".



Two—#261 Heald Precision Rotary Surface Grinders, serials 33579. New in 1953. 12" diameter magnetic chucks. For grinding flat, concave and convex surfaces.

Machine Tools

LAURENS BROS., INC.

2780 HIGHLAND AVE. NORWOOD

CINCINNATI 12, OHIO

IMMEDIATE DELIVERY
BRAND NEW

CYRIL BATH

(STURDYBENDER)

POWER PRESS BRAKES

#100- 8	8' x 3/16"	10' Bed
#100-10	10' x 8 GA.	12' Bed
#120-10	10' x 3/16"	12' Bed
#150- 8	8' x 5/16"	10' Bed
#150-10	10' x 1/4"	12' Bed

Purchasers of Cyril Bath Brakes are entitled to services of a factory representative to assist and supervise installation, and instruct personnel in operation and maintenance. NO CHARGE FOR THIS SERVICE.

PRESS & SHEAR MACHINERY CORP.
2600 EAST TIOGA STREET
PHILADELPHIA 34, PA.
GArfield 6-8840

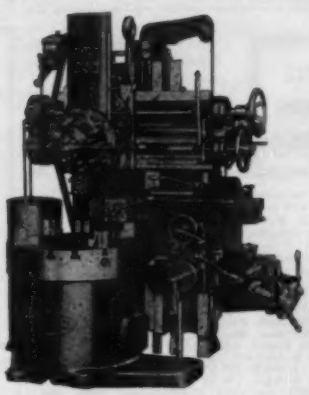
WILL LEASE WITH OPTION TO PURCHASE, OR WILL FINANCE OVER LONG TERM

HILL-CLARKE

BEST BUY OF THE MONTH

- Your machine is ready to operate upon arrival.
- You can inspect the machine under power before you buy.
- You get detailed, accurate information on every machine.
- You are protected by an unrestricted guarantee.
- You benefit from the complete remanufacturing facilities in our 58,000 sq. ft. plant.
- You can buy with confidence in our 90 years experience in the machinery business.

36" Bullard Spiral Drive Vertical Turret Lathe, 220/440 Volt Motor, Standard Speed, Coolant System, 3 Jaw Universal Chuck, Excellent, Serial 19082, New 1942. $15,500.00



Ask for Complete Listings

HILL-CLARKE MACHINERY COMPANY

PHONE: CRawford 7-2000

2106 S. KILBOURN AVE., CHICAGO 23, ILL.

FOR SALE

1500-TON BLISS SINGLE ACTION STRAIGHT SIDE HYDRAULIC PRESS
Serial:—#110085
Area of Bed:—49" RL, 48" FB
Maximum Stroke:—15"
Daylight:—35"
Press Speed Inches Per Minute
Quick Advance 395", Pressing 13", Return 320"
Working Pressure:—2650# Per Sq. Inch
Bolster:—7½" Thick
Northern Pump:—#5630—Capacity:—66 GPM
60 HP, 685 R.P.M. Main Motor, 3 HP, 1150 R.P.M. Auxiliary
Motor with Double Shaft Extension, 440 Volt, 3 Phase, 60 Cycle
Overall Height:—22'3"

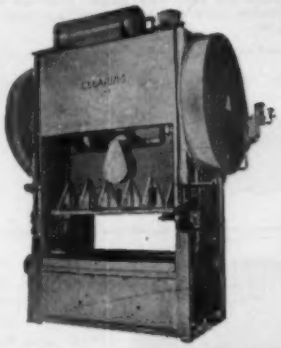
500-TON HPM SINGLE ACTION STRAIGHT SIDE HYDRAULIC PRESS (FASTRAVERSE)
Serial:—#46-357
Area of Bed:—36" x 36"
Daylight:—42"
Cushion:—166 Tons
325 Gallon Reservoir
100 H.P. Westinghouse Motor 220/440, 3 Phase, 60 Cycle

200-TON CLEARING SINGLE ACTION STRAIGHT SIDE CRANKLESS PRESS
Model:—F-1200-42
Serial #41-5444
Area of Bed:—44" RL x 38" FB
Maximum Stroke: 30"
Shunt Height:—24"
Motor 25 HP, 220/440 Volt, 3 Phase, 60 Cycle
Strokes Per Minute:—Up to 35
Floor Space:—107" x 84" x 196" High
Weight:—35 Ton

125-TON BLISS #306 STRAIGHT SIDE PRESS
Model:—#306
Serial:—#7685
Area of Bed:—25" RL x 26" FB
Bolster:—3" Thick
Stroke:—9¾"
Shut Height:—21½" To Bolster
Ram Area:—20" RL x 22" FB
Air Cushion and Cylinder
Fairbanks Morse Motor:—15 HP 3/60/220
Push Button Station

FS-5497, American Machinist, Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

WORLD'S LARGEST STOCK
STAMPING PRESSES
BLISS • CLEARING • CLEVELAND
FERRACUTE • HAMILTON • L & J
NIAGARA • TOLEDO • V & O

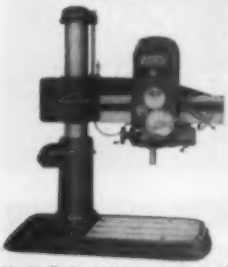


SQUARING SHEARS • PRESS BRAKES
REBUILT and GUARANTEED

JOSEPH HYMAN & SONS
TIOGA, LIVINGSTON & ALMOND STS.
PHILADELPHIA 34 PA. Phone GArfield 3-8700

Cimco

SELECT MACHINE TOOLS



3'11" column American Helewizard Radial Drill, motor on head, 12 speeds, late type.

4'11" column American Helewizard Radial Drills, motor on head, 12 speeds, late type.

You'll find what you want . . . in both quantity and quality . . . at Cincinnati Machinery Company, industry leaders in buying, rebuilding, selling and guaranteeing fine surplus metalworking.

Let us quote a firm price on rebuilding any machine tool in your plant.

Cincinnati Machinery
COMPANY, INCORPORATED
3901 Kellogg Ave., Cincinnati 26, Ohio
Phone TRinity 1-0853

GOOD USED MACHINE TOOLS
100 KVA Ford butt welder, 440 V service.
100 KVA Taylor Winfield portable spot welder, 440 V.
50 KW Belaky dynatrol automatic cycle press type spot welder
Type R Economy automatic threading or pointing machine, late
9/16" National Precision thread roller, MD
Model 11 S Rickert-Shafer nipple threader
No. 2 Allen type HMT lead screw tapper and sensitive drill
No. 5 Holmes tilted nut tapper, 6 station
No. 10 Warner & Swasey vertigal tapper and threader
38" throat New Duty Model No. 17F single geared, single end, punch or shear
36" Rockford spoonside universal shaper-planer, mechanical
10½" x 10½" No. 3 Meth & Merrywesther cold metal saw, late
10" x 10" Racine hydraulic shear cut hack saw, MD
6" x 6" Peerless universal shaping saw
6" x 6" No. 6 Marvel "high speed" hack saw, MD
S. F. Haller hydraulic roll feed and stock straightener
No. 10 Kane and Roach straightening roll
No. 1-L Kane and Roach vertical type bending roll
750 ton No. 3 National Manipress, forging, late
60 ton Henry & Wright high speed dining press
50 ton Henry & Wright high speed dining press
80 ton No. UA80 Niagara adjustable knee, punching type
85 ton No. 8 Bliss Consolidated OBI
60 ton No. 60DB Perkins OBI
60 ton No. 6 Toledo OBI
54 ton No. 5 V. & O. OBI
43 ton No. 5A Toledo OBI
600 ton Model 2E48-600 Hamilton s.s. single crank, air clutch, late
250 ton Williams White 4-post hydraulic
150 ton HPM "Hydra-Power" Fastraverse hydraulic
44 ton No. 14½ Toledo herning and wiring
200 ton No. 7 x 72" Bliss double crank straight side tiered frame
60 ton No. 603 General Flexible power and straightening press
ASK FOR YOUR COPY OF STOCK LIST
MILES MACHINERY COMPANY
2039 E. Genesee St., Saginaw, Michigan
Telephone PL 2-3105

BENNETT MACHINERY CO.
BORING MILLS, 4" Sellers, Thin Type, Late
8" bar Yoder, Table Type, 1944
10' Niles Vertical, 2 Hds. M.D.
36" & 24 Bullards, New Era Type
5" Sellers Thin Type, Late
GRINDERS, No. 36 Hanchett Vert. Rotary, 44
36" x 42" P. & W. Vert. Surf., '42
66" Hanchett Vert. Spin. Surf., No. 300
10" x 20" B. & S. No. 1 Univ., 1942
LATHES, 36" x 21' cen. N.B.P. Grd. Hd., T.A., 22" x 48" cen. LeBlond, 21" sw., '41
18" x 78" cen. Sidney, T.A., 19½" sw., 1952
TURRETS, Nos. 2L, 5 & 3 Gisholts, Late
Nos. 2 W. & S. & 2 & 2G Morses, Late
MILLERS, No. 2A B. & S. Univ. Tim.
No. 4B K. & T. Vert., Table 102" x 19" overarm
RADIAL DRILLS, 6'10" col Cortico M.D
375 Allwood Rd., Clifton, New Jersey
Phone: PRescott 9-8996 N. Y. Phone: LOngacre 3-1227

FOR SALE
500 Ton Hobbing Press Self-Contained $3100.00
200 Ton Hobbing Press Self-Contained $2420.00
2½ Oz. Injection Molding Machine New
12 x 12 Hand Operated Hot Plate Presses 20 Ton Capacity
CLIFTON HYDRAULIC PRESS CO.
289 Alwood Rd. Clifton, New Jersey

CHOICE MACHINE TOOLS

K & T 1404 Prod. Mill 1943
CINN. I-18 Prod. Mill 1951
TOCCO 200 KW, 3,000 cy. 1943
TOCCO 80 KW, 10,000 cy. 1943
GISHOLT #3 Air Chuck & Cyl. 1943
WARNER & SWASEY 2A Bar Feed 1946
3" AJAX Air Clutch Upsetter, 1947
CINCINNATI 5-54 duplex broach, 1948
LAPOINTE, Vert. Broach 20T, 90" st. 1941
CINN. Cyl Grinder 6x18 Plunge 1945
CINN. Cyl. Grinder, 10x18 Plunge 1941
CINN. Cyl. Grinder, 16x22 Plunge 1943
CINCINNATI 1066 horizontal 2-way, 1946
EXCELLO #33 Thread Grinder 1942
NORTON Cyl. Grinder, 8x18 Plunge 1944
HANCHETT #900 Face Grinder 1944
ROCKFORD Hyd. Vert. Shaper, 12" st. 1944
GRAY DH Planer, 60x60x12, 4 heads, DC drive
BETTS DH Planer, 84x84x16, 4 heads, DC drive
SUMMER & ADAMS Thread Mill, 10", H.I.S. 1943
BIGNALL & KEELER 6" pipe threader, 1940
BIGNALL & KEELER 12" pipe threader, 1949
BIRDSBORO hydraulic straightening press, 600 ton, 60x72 bed, 10" stroke, 36" daylight (3) 1942

NOLL EQUIPMENT CO.
4535 St. Clair Ave., Cleveland 3, O.
EXpress 1-0700

BLANCHARD GRINDING

To 85" diameter and up to 20"x120"
- 24 Hour Service
- Ground Steel & Aluminum Plate, any size, shape or thickness.
- Weldments
- Shear blades sharpened up to 10'

SAL METAL PRODUCTS CO.
DEPT. AM
120 Freeman St., Brooklyn 22, N. Y.
EVergreen 9-2560

DON'T FORGET

the box number when answering advertisements. It is the only way we can identify the advertiser to whom you are writing.

EMPLOYMENT OPPORTUNITY

Gear Cutting Supervisor

Modern plant on eastern seaboard. Man 35 to 50 years of age to take complete charge of gear cutting division, must be thoroughly familiar with mathematical calculations, setting up and operating all types of gear equipment. Experienced in handling men.

Small job operation with all large company benefits. Firm established many years, and successful applicant will have good future in compensation and security.

Write, stating age, education, complete resume of experience and salary desired.

P-5599 American Machinist
Class. Adv. Div., P.O. Box 12, N. Y. 36, N. Y.

FOR RATES OR INFORMATION

About Classified Advertising,

Contact The McGraw-Hill Office Nearest You.

ATLANTA, 3
1301 Rhodes-Haverty Bldg.
JAckson 3-6951
M. MILLER

BOSTON, 16
350 Park Square
HUbbard 2-7160

CHICAGO, 11
520 No. Michigan Ave.
MOhawk 4-5800
W. HIGGENS
J. BRENNAN

CINCINNATI, 37
1825 Yorktown Road
Swifton Village, Apt. 2
G. MILLER

CLEVELAND, 15
1510 Hanna Bldg.
SUperior 1-7000
W. SULLIVAN

DALLAS, 2
Vaughn Bldg.
RIverside 7-5117
G. JONES
E. SCHIRMER

DETROIT, 26
856 Penobscot Bldg.
WOodward 2-1793
W. STONE

LOS ANGELES, 17
1125 W. 6 St.
MAdison 6-9351
H. KEELER
D. McMILLAN

NEW YORK, 36
500 Fifth Ave.
OXford 5-5959
S. HENRY
D. COSTER
R. LAWLESS

PHILADELPHIA, 3
17th & Sansom St.
RIttenhouse 6-0670
H. BOZARTH
R. EDSELL

ST. LOUIS, 8
3615 Olive St.
JEfferson 5-4867
W. HIGGENS

SAN FRANCISCO, 4
68 Post St.
DOuglas 2-4600
R. ALCORN

LATE MODEL LATHES

- 16"x54" cc Cincinnati G.H.
- 16"x54" cc American G.H.
- 20"x72" cc Monarch G.H.
- 14"x30" cc Monarch Magnamatic with Tracer Attachment
- 44"x32' cc Putnam Geared Head

MARTIN J. SUSSMAN CO.
442-444 Lehigh St.
Allentown, Pa.
We Solicit Your Inquiries

BOOKS

Used by U. S. Armed Forces
MACHINE TOOL RECONDITIONING
2nd printing
Write for free folder describing illustrated book.
MACHINE TOOL PUBLICATIONS
215 Commerce Bldg., 4th & Wabash Sts.
St. Paul 1, Minn.

W & W No. 2 Hyd. Tube Bender.
Eastman 14" Comparator, Ped.
Cinn. 4' x ¼" Power Brake, New.
Cincinnati 10' x 3/8" Squaring Shear, 1937.
D. E. DONY MACHINERY CO.
4357 St. Paul Blvd., Rochester 17, N. Y.

ELECTRIC FURNACES TO 1850F
with Auto Temp Control. Sliding door, heavily insulated, substantial, accurate, dependable for machine shop, tool room, laboratory New
8"x12"x15" inside 4.5 K.W. $300.00
12"x16"x20" inside 9.0 K.W. $500.00
E. H. WILLIAMS
BOX 9042A, HUNTINGTON, W. VA.

10 to 12 foot lengths
Any diameter up to 1¼ inch
All thread forms
All metals
H&G threaded rods
For studs, hangers, worms, translating screws, etc.
20 Barclay St., N. Y.
Eastern Machine Screw Corp., New Haven Conn.

REPLIES (Box No.) Address to office nearest you c/o this publication Classified Adv. Div.
NEW YORK: P. O. Box 12 (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

Tool Room Supervisor: Position in Wilmington, Delaware plant for man experienced in all phases of tool & die making. Some designing experience helpful. Supervisory experience desirable. Send complete resume to: Manager of Industrial Relations, National Vulcanized Fibre Co., Wilmington 99, Del.

SELLING OPPORTUNITIES WANTED

Manufacturers' agent—Chicago Midwest. Selling products to O.E.M. and Industrials; Mech. Eng. background in mfg., design & controls. Desires repeat line of merit and potential. RA-5562, American Machinist.

POSITION WANTED

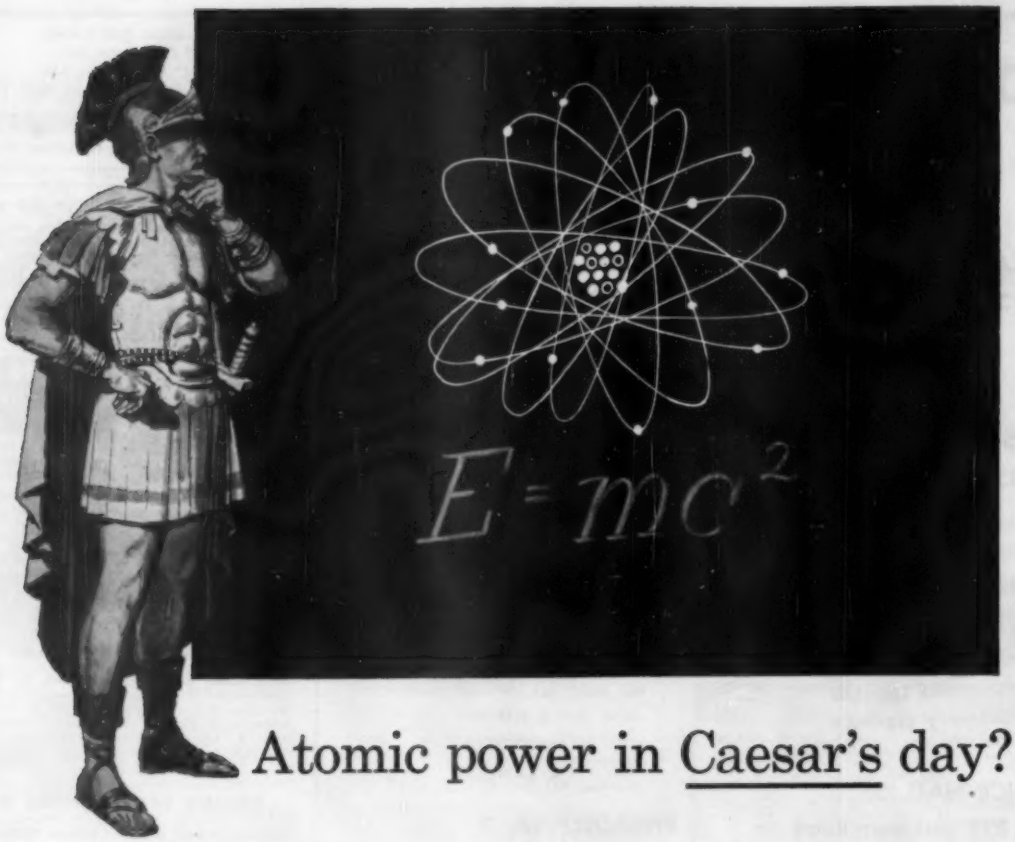
Plant Supt. Mgr., M.E. Staff caliber. All phases prod., tooling machine building. Precise, efficient, highly diversified. Seeking final assignment. PW-5421, American Machinist.

Position with metal fabricating, or metal processing company. Primary interest lies in production, manufacturing, and cost departments. MBA degree, 1954, Harvard Business School. BS degree, Industrial Engineering, 1952, Yale University. Present — Assistant Navy Exchange Office. To be released December 1957. Married, one child. PW-5537, American Machinist.

Don't forget the

BOX NUMBER

. . . when answering the classified advertisements in this magazine. It's our only means of identifying the advertisement you are answering.



Atomic power in Caesar's day?

Certainly!

It was there, in the ground, in the air and water. It always had been. There are no more "raw materials" today than there were when Rome ruled the world.

The only thing new is knowledge . . . knowledge of how to get at and rearrange raw materials. Every invention of modern times was "available" to Rameses, Caesar, Charlemagne.

In this sense, then, we have available *today* in existing raw materials the inventions that can make our lives longer, happier, and inconceivably easier. We need only *knowledge* to bring them into reality.

Could there possibly be a better argument for the strengthening of our *sources* of knowledge—our colleges and universities? Can we possibly deny that the welfare, progress—indeed the very *fate*—of our nation depends on the quality of knowledge generated and transmitted by these institutions of higher learning?

It is almost unbelievable that a society such as ours, which has profited so vastly from an accelerated accumulation of knowledge, should allow anything to threaten the wellsprings of our learning.

Yet this is the case

The crisis that confronts our colleges today threatens to weaken seriously their ability to produce the kind of graduates who can assimilate and carry forward our rich heritage of learning.

The crisis is composed of several elements: a salary scale that is driving away from teaching the kind of mind *most qualified* to teach; overcrowded classrooms; and a mounting pressure for enrollment that will *double* by 1967.

In a very real sense our personal and national progress depends on our colleges. They *must* have our aid.

Help the colleges or universities of your choice. Help them plan for stronger faculties and expansion. The returns will be greater than you think.

If you want to know what the college crisis means to you, write for a free booklet to: HIGHER EDUCATION, Box 36, Times Square Station, New York 36, New York.

HIGHER EDUCATION
KEEP IT BRIGHT

PUBLIC SERVICE ADVERTISING COUNCIL

Sponsored as a public service, in cooperation with the Council for Financial Aid to Education

Index of PRODUCTS ADVERTISED

In This Issue

Abrasives, Coated 21
Accessories & Attachments (Machine Tool) 32, 147, 210, 215
Arbors & Mandrels 210

Bearings 82
Boring, Drilling & Milling Machines (Horizontal) 14-15, 56-57, 76
Boring Machines, Internal ... 2nd Cover, 60
Broaching Machines 26-27, 121, 122, 162
Brushes 182

Chucks 68, 183, 193, 215
Collets 34
Cut-Off Machines 52

Die Sets 165
Drilling Machines 36-37, 43, 45, 67, 85, 145, 167
Duplicators & Pantographs 58

Electrical Parts & Equipment 20
Exhibits 188

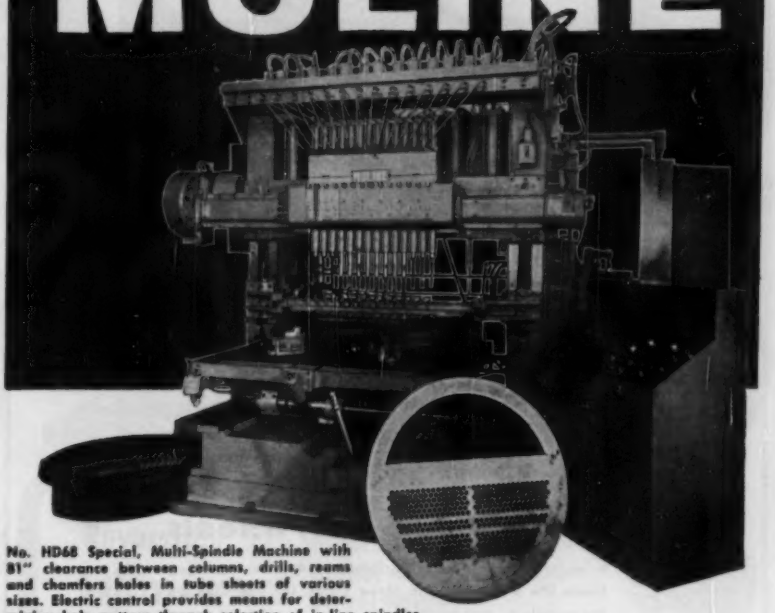
Fasteners .....3rd Cover, 32B, 124, 174
Feeders 194

Gages, Instruments & Testing Equipment 46-47, 164, 171, 172, 175, 177
Gear Cutting Machines 3, 6-7, 51, 122
Gear, Speed Reducers, Motor Reducers 151, 209
Gear Testers 3, 6-7
Grinders—Cutter & Tool 216
Grinding Machines—Production—12-13, 16-17, 18-19, 42, 80-81, 126, 216
Grinding Wheels 21, 59

Heads: Drilling, Grinding & Tapping 10-11
Heat Treating Equipment & Supplies 155
Hydraulic & Pneumatic Parts & Equipment 187

(*Continued on page* 210)

MOLINE



No. HD68 Special, Multi-Spindle Machine with 81" clearance between columns, drills, reams and chamfers holes in tube sheets of various sizes. Electric control provides means for determining hole pattern through selection of in-line spindles and control of two-way, positive-positioned hydraulic indexing work table.

For Greater...
PRODUCTION • EFFICIENCY • SAVINGS

Use an individually designed "Hole-Hog" Machine Tool for such jobs as:

- Multi-Spindle Boring
- Single and Multi-Spindle Honing
- Straight Line Multi-Drilling
- Adjustable Spindle Drilling
- Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
- Special Multiple Operation Machine Tools

Over 50 years of Machine Tool Engineering experience is at your service. Tell us your particular problem.

MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS

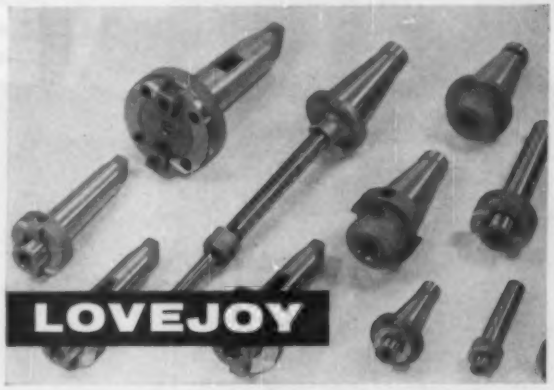
MOLINE TOOL COMPANY
100 20TH STREET MOLINE, ILLINOIS
Representatives in principal cities. 109

BILGRAM TRADE MARK

ANGLE BEVEL GEARS WITH GENERATED TEETH

ALL TYPE GEARS

BILGRAM
GEAR & MACHINE WORKS
1217-35 Spring Garden
Philadelphia, Pa.



milling cutter Arbors

• made of alloy steel, heat treated for maximum toughness • precision ground to ensure concentricity of nose and taper shank • hardened drive keys securely held by cap screws • replaceable in case of damage

Flywheels

• Improve milling cutter performance • Increase cutting blade life • available in three styles, for mounting on the spindle of any machine

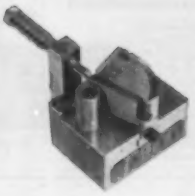
Write for Catalog No. 33

LOVEJOY TOOL COMPANY, INC.

141 Main Street, Springfield, Vermont

PRE-SET CHASERS

AVOID CHASER-WASTING REGRINDS



Each Chaser is Pre-set in its Best Cutting Position, using the Murchey Micrometer Setting Fixture, thus equalizing cutting load and chaser wear. It also eliminates the waste of heavy prescribed regrinds and pitch diameter adjustments.

When Pre-set Chasers in their holding blocks are used in the Murchey Tangent Die Head, machine down time for chaser change-over is less than one minute.

For details on Lower Cost Per Thread, write to the Sheffield Corporation, Dayton 1, Ohio, U.S.A., Dept. 1.

the SHEFFIELD corporation

7806

Index of PRODUCTS ADVERTISED In This Issue

(*Continued from page* 209)

Jig Borers 211

Jigs & Fixtures 176, 210

Keyseaters 215

Lathes, Automatic 54

Lathes, Engine 45, 53, 58

Lathes, Turret 22-23, 30-31, 54

Lubricants, Cutting Fluids, Quenching Oils & Solvents 64-65, 169, 185

Materials, Cutting & Forming ..... 4th Cover, 48-49, 61, 147, 161, 192

Materials of Manufacture 61, 62-63, 70-71, 163, 170, 173, 174, 197, 198-199

Materials Handling Equipment 40

Millers, Die Sinkers, Profilers 4-5, 8-9, 184

Motors, Electrical 149

Power Transmission 78, 128, 158

Presses, Forging & Forming Equipment & Supplies 35, 50, 52, 72, 86, 88, 160, 168, 180-181, 196, 200

Riveting Machines 213

Rust Preventives 186

Safety & Welfare Equipment 195

Saw Blades 44

Sawing Machines 33, 44, 153, 172

Screw Machines; Chucking Machines 38-39, 41, 156-157, 166

Shapers & Slotters 88

Special Machine Tools 28-29, 36-37, 159, 176, 209

Spindles, Machine 212

Tapping Machines 36-37

Thread Cutting Machines 213

Tools, Cutting ..... 24-25, Insert Facing 32, 48-49, 55, 66, 69, 74, 122, 146

Used & Surplus Equipment 202-207

Vises 211, 214

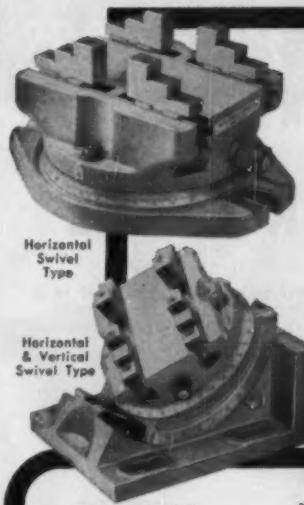
Welding & Cutting Equipment & Supplies 189

INDEX TO ADVERTISERS

This index is published as a convenience to the readers. Every care is taken to make it accurate, but American Machinist assumes no responsibility for errors or omissions.

	Page
Aaron Machinery Company Inc.	45
Aluminum Company of America	174
American Chain & Cable Co., Inc.	40, 172
American Machinist	190-191
American Optical Company	195
American Society for Metals	188
American Steel Foundries, Elmes Engineering Division	72
American Tool Works Co.	43
Ames Company, B. C.	171
Armstrong Blum Mfg. Company	44
Armstrong Brothers Tool Company	32
Atlantic Refining Company	185
Automation Devices, Inc	194
Bay State Abrasive Products Co.	59
Bethlehem Steel Company	161
Bilgram Gear & Machine Company	209
Blanchard Machine Co.	42
Boston Gear Works	151
Bridgeport Brass Company	170
Brown & Sharpe Mfg. Co.	69, 80-81
Bryant Chucking Grinder Co.	156-157
Bullard Co.	76
Burg Tool Mfg. Company, Inc.	85
Century Electric Company	149
Cincinnati Gilbert Machine Tool Co.	167
Cincinnati Grinders, Incorporated	16-17
Cincinnati Milling Machine Company	4-5
Cincinnati Shaper Company	88
Cities Service Oil Co.	169
Cleveland Crane & Engineering Co.	86
Cleveland Punch & Shear Works Co.	196
Cleveland Twist Drill Co. Insert Facing	32
Columbia-Geneva Steel Div.	70-71
Columbus Die-Tool & Machine Co.	176

(*Continued on page* 212)



Multi-Purpose Vises

4 STEPPED JAWS PERMIT CLAMPING of rough castings, irregularly shaped, round, and tapered pieces accurately and quickly, eliminating need for special jigs or fixtures. Narrow stepped jaws allow free access to and measuring of work pieces and provide clearance for cutting tools. Small work pieces machined on three sides without reclamping. Rigid in any position. Various capacities and extra soft jaws available.

Reversible Safety Tapping Attachments

with adjustable graduated friction drive, hardened, ground and lapped, complete with torque bar and handles. Precision made throughout.

Tested for Performance to American Standards

ALSO AVAILABLE:

- **Dial Vernier Calipers • Keyless Drill Chucks**
- **Quick Change Chucks & Collets**

Immediate Delivery From N.Y. Stock.

DISTRIBUTOR INQUIRIES INVITED

MBI

Write for Descriptive Booklet and prices.

Our Headquarters In New York City

M.B.I. export & import ltd.

A Division of Machinery Builders Inc.

475 GRAND CONCOURSE, BRONX 51, NEW YORK

Phone: MOtt Haven 5-0900

"Over 25 years experience in designing and building machinery"

Handle your small part precision JIG BORING on the LINLEY JIG BORER

Why tie up your big, costly jig borers on small work when you can get maximum utility at less cost per hour on a machine exactly fitted to your work? Put your small work on the LINLEY where it belongs and reserve your large machines for large work, *where large work belongs*. You'll save money this way.

SPECIFICATIONS

Table Movement: 6" x 10" — Table Size: 7" x 17½"

Complete details sent promptly on request

LINLEY BROTHERS CO.

664 STATE ST. EXT., BRIDGEPORT 1, CONN.

Now Available

NEW EDITION OF

TOOLS OF OUR TRADE

With 104 fact-filled and fully illustrated pages, this booklet is a *must* for your apprentice-training program. Also a handy "brush-up" or refrence booklet for busy production executives. Includes the following:

- KNOW YOUR MEASURING TOOLS
- KNOW YOUR HAND TOOLS
- KNOW YOUR INSPECTION TOOLS
- HOW TO RUN A MILLING MACHINE
- HOW TO RUN A DRILLPRESS
- HOW TO RUN AN ENGINE LATHE
- HOW TO RUN A GRINDING MACHINE

Price: $1.25 per single copy
$1.00 per copy in lots of 100 or more

American Machinist

Reader Service Department
McGRAW-HILL BUILDING
NEW YORK 36

To an engineer who likes to write, we're offering
A CAREER IN INDUSTRIAL ADVERTISING

If you are familiar with production machinery and like to write, here is an opportunity to enter the advertising agency business at the executive level. You will work into management of some of our leading machine tool accounts—planning, directing and creating their advertising, merchandising and marketing. Writing is important—but not "fancy" writing. We think good industrial copy begins with the ability to think clearly and logically—to understand the problem. Then, we believe, the solution and the writing come naturally and easily.

Who are we? We are one of the Midwest's fastest growing agencies. We are young and creative; we like to work. We number many fine companies among our clients. Among them—The R. K. LeBlond Machine Tool Company; National Automatic Tool Company, Inc. (Natco); The Fredick Machine Tool Company; Precision Welder and Flexopress Corporation; Arrow Engineering Co., Inc. A good proportion of our more than $2,000,000 billing is in industrial accounts. We are potidly situated in Cincinnati, heart of the machine tool country.

If all this sounds like a career you'll want, by all means write us. We will treat your inquiry confidentially. Tell us all about yourself, and we'll make arrangements to discuss our future together.

FARSON, HUFF & NORTHLICH, INC.
700 Terrace Hilton Bldg., Cincinnati 2, Ohio

INDEX TO ADVERTISERS

(*Continued from page* 211)

	Page
Cone Automatic Machine Co.	41
Cone Automatic Machine Company Pilot Division	58
Continental Tool Works Div., Ex-Cell-O Corporation	74
Cross Company	28-29
Crucible Steel Co. of America	61
Cushman Chuck Company	183
Davis & Thompson Co.	213
Davis Keyseater Company	215
Detroit Die Set Corp.	165
du Mont Corporation	66
Eastman Kodak Co. Industrial X-Ray	177
Edlund Machinery Company	145
Elmes Engineering Div., American Steel Foundries	72
Ex-Cell-O Corp.	60, 74
Farson, Huff & Northlich, Inc.	212
Fawick Airflex Division, Fawick Corporation	78
Federal Machine & Welder Co.	200
Federal Products Corp.	46-47
Fellows Gear Shaper Company	6-7
Foote-Burt Company	121
Gallmeyer & Livingston Co.	216
Gardner Machine Company	21
Gates Rubber Company	158
Giddings & Lewis Machine Tool Company	14-15
Gisholt Machine Company	30-31
Gleason Works	3
Goss & deLeeuw Machine Company	166
Grant Mfg. & Machine Company	213
Greaves Machine Tool Company	184
Hardinge Brothers, Inc.	34
Heald Machine Company Sub. Cincinnati Milling Machine Co.	2nd Cover

INDEX TO ADVERTISERS

	Page
Hendey Div. of Barber-Colman Co.	53
Holo-Krome Screw Corporation	3rd Cover
Houghton & Co., E. F.	64-65
International Research & Development Corp.	164
Jones & Lamson Machine Co.	54
Jones & Laughlin Steel Corp.	197
Kaiser Aluminum & Chemical Sales, Inc.	198-199
Landis Machine Company	10-11
Landis Tool Company	12-13
La Pointe Machine Tool Company	26-27, 162
Lees-Bradner Company	51
Leland-Gifford Company	67
Linley Brothers Co.	211
Lodge & Shipley Company	52
Lovejoy Tool Company, Inc.	210
Lucas Machine Div., New Britain Machine Co.	56-57
M. B. I. Export & Import Ltd	211
Metal Carbides Corp.	192
Metallurgical Products Department, General Electric Company	48-49
Moline Tool Company	209
Morse Twist Drill & Machine Co.	24-25
Motch & Merryweather Machinery Co.	153
National Acme Company	38-39
National Automatic Tool Co., Inc.	36-37
National Broach & Machine Co.	122
Nelco Tool Co., Inc.	69
New Britain Machine Co., The Lucas Machine Division	56-57
New Departure Div., General Motors Corporation	82
Niagara Machine & Tool Works	35
Nilson Machine Co., A. H.	168
Norton Company	18-19

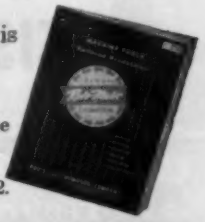
(Continued on page 214)

Double End Threading of 280 Shafts per hour

. . . with Davis & Thompson Roto-Matic and Automatic Ejection

Here's another example of Davis and Thompson Engineering of high production with a minimum of equipment. This GG-8 horizontal threader is equipped with 4 spindles in each head and a 4 station fixture. It is one of countless threading machines that have been designed and built by Davis & Thompson since 1924. Both single and double end machines for pipe, conduit, shafts and similar parts in various production quantities have been produced.

If you have work of this nature, call in a Davis & Thompson Representative. There is no obligation for this service.



ADDITIONAL INFORMATION Get the complete story of the facilities available from Davis and Thompson. Write for this 8-page booklet today. Ask for Bulletin #1002.

Roto-Matic

Davis and Thompson Co.

4460 N. 124th ST. MILWAUKEE 10, WISCONSIN

GRANT

RIVETERS — PIONEERS in their line — head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method — Sizes to meet all needs — Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.

85 Silliman Ave., Bridgeport, Conn., U. S. A.

"I BUY ON COLD, HARD FACTS!"

WRITE FOR NEW FREE CATALOG!

WILTON TOOL MFG. CO., INC.
SCHILLER PARK, ILLINOIS

PRECISION PRODUCTION at GRAFLEX

At Graflex, Inc., in Rochester, N.Y., operators inspect their own work and get paid for it, and foremen have full freedom of action. These are just two important characteristics of the organization of the camera and precision-equipment manufacturer bearing this familiar name.

This *American Machinist* Special Report by Executive Editor E. J. Tangerman describes production methods at Graflex in detail. Over fifty photographs and other illustrations add to the value of the twenty-page report.

20 pages — — — 25 cents per copy

Reader Service Department

American Machinist

McGraw-Hill Building **New York 36, N. Y.**

INDEX TO ADVERTISERS

(*Continued from page 213*)

	Page
Ohio Crankshaft Company	155
Oliver Corp. A. B. Farquhar Div.	160
Osborn Mfg. Co.	182
Parker Rust Proof Company	186
Perry Equipment & Engineering Co. Div. of Automation Devices, Inc.	194
Pipe Machinery Company	175
Reid Brothers Co., Inc.	126
Republic Steel Corp.	62-63
Reynolds Metals Company	173
Robbins Co., Omer E.	159
Schrader's Son, A. Div. Scovill Mfg. Co. Inc.	187
Sciaky Bros. Inc.	189
Sharon Steel Corporation	163
Sheffield Corp.	210
Skinner Chuck Company	193
Standard Pressed Steel Co.	32B
Standard Tool Company	55

American Machinist
ADVERTISING SALES STAFF

Atlanta 3 . . . M. H. Miller, 1301 Rhodes-Haverty Bldg., Jackson 3-6951

Boston 16 . . . J. H. Koch, 350 Park Square Bldg., Hubbard 2-7160

Chicago 11 . . . W. J. Haring, Bayard Nicholas, 520 N. Michigan Ave., Mohawk 4-5800

Cincinnati 8 . . . R. H. Anderson, 2627 Erie Ave., East 1-6110

Cleveland 15 . . . Gifford W. Plume, Jr., 1510 Hanna Bldg., Superior 1-7000

Dallas 1 . . . C. L. Jones, Jr., 901 Vaughn Bldg., 1712 Commerce St., Riverside 7-5117

Denver 2 . . . John W. Patten, Mile High Center, 1740 Broadway, Alpine 5-2981

Detroit 26 . . . W. J. Reichard, 856 Penobscot Bldg., Woodward 2-1793

Los Angeles 17 . . . H. L. Kosler, 1125 West Sixth St., Madison 6-9351

New York 36 . . . G. H. Krimsier, D. G. Sawer, 500 Fifth Ave., Oxford 5-5959

Philadelphia 3 . . . J. P. Tiebout, Architects' Bldg., 17th & Sansom Sts., Rittenhouse 6-0670

Pittsburgh 22...K. Reeves Cook, 1111 Oliver Bldg., Atlantic 1-4707

St. Louis 8 . . . Bayard Nicholas, 3615 Olive St., Continental Bldg., Jefferson 5-4867

San Francisco 4 . . . R. C. Alcorn, 68 Post St., Douglas 2-4600

England . . . Herbert Legler, McGraw-Hill House, 95 Farringdon St., London, E. C. 4

INDEX TO ADVERTISERS

	Page
Steelweld Machinery Division Cleveland Crane & Eningeering Company	86
Sundstrand Pneumatic Products Div. Sundstrand Machine Tool Co.	215
Swiss Federation of Watch Mfg.	178-179
Tannewitz Works, Inc.	172
Tennessee Coal & Iron Div.	70-71
Timken Roller Bearing Company Steel & Tube Div.	4th Cover
United States Steel Corporation	70-71
United States Steel Export Co.	70-71
United States Steel Supply Div., United States Steel Corp.	70-71
U. S. Tool Co., Inc.	50
Van Norman Machine Co.	8-9
Vascaloy-Ramet Corporation	147
Verson Allsteel Press Corp.	180-181
Vickers Electric Div. Vickers Inc., Unit of Sperry Rand Corp.	128
Vlier Engineering, Inc.	124
Walker Co., Inc., O. S.,	68
Walker-Turner Div. Rockwell Mfg. Co.	33
Warner & Swasey Company	22-23
Westinghouse Electric Corp.	20
Wilson Mechanical Instrument Div. American Chain & Cable Co., Inc.	172
Wilton Tool Mfg. Co., Inc.	214

CLASSIFIED ADVERTISING

F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES 207

EDUCATIONAL
Books 207

EQUIPMENT
(Used or Surplus New)
For Sale 202-206

ADVERTISERS INDEX

Bennett Machinery Co. 206
Cincinnati Machinery Co. 206
Clifton Hydraulic Press Co. 206
Dony Machinery Co., D. E. 207
Eastern Machine Screw Corp. 204
Falk Machinery Co. 204
Hill-Clarke Machinery Co. 205
Hyman & Son, Joseph 206
Laurens Brothers, Inc. 205
Machine Tool Publications 207
Miles Machinery Co. 206
Morey Machinery Co., Inc. 203
Noll Equipment Co. 206
Press & Shear Machinery Corp. 205
Sal Metal Products Co. 206
Sussman Co., Martin J. 207
S & M Machinery Co. 202
Williams, Edward Hale, M. E. 207

HOW TO CUT SET-UP TIME WITH Sundstrand Magnetic Chucks

Here are two more examples of the profitable application of Sundstrand magnetic chucks to grinding operations. Similar, profitable applications have been made to milling jobs.

No matter how you are holding work pieces now, in grinding and milling, talk to a Sundstrand engineer. There is no obligation for this service.

SET-UP TIME CUT 30%

12"x96" transverse pole magnetic table on vertical spindle grinder holds various sizes of H.S.S. broaching tools at an average savings in set-up time of 30% over former method.

SET-UP TIME CUT 20%

Four 10"x40" POWER-GRIP Chucks on a 24"x96" horizontal spindle surface grinder hold ways, way caps, valve plates, broach holders etc. The four chucks can be operated individually or as one complete unit. Set-up time averages 20% less than previous method.

GET MORE FACTS

Write for further information on holding work for both grinding and milling operations.

Bulletin 181-M

SUNDSTRAND POWER-GRIP

SUNDSTRAND Magnetic Products Co.

Division of Sundstrand Machine Tool Co.
1020-9th ST. • ROCKFORD, ILLINOIS

LOOKING FOR A SPECIFIC PRODUCT?

See the Index of Products Advertised in each issue. You'll find products advertised classified by type with page numbers of the advertisements.

AMERICAN MACHINIST
McGraw-Hill Building, New York 36, N. Y.

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1 in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 483 Exchange St., Rochester, N. Y.

FOUND WHERE WORLD FAMO

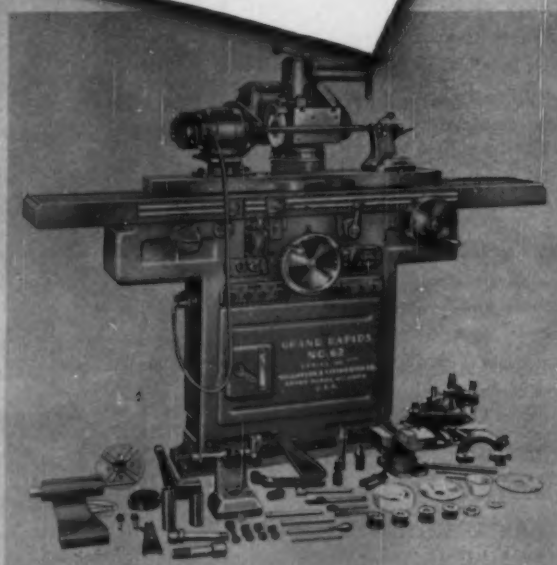
GRAND RAPIDS GRINDE

PRODUCTION DEPARTMENT

MEMO TO: Pete

This sounds to me like the grinder we want!

George



Grand Rapids Universal Tool and Cutter Grinder, No. 62

- Wheel head moves to work—not work to head—for extra rigidity and convenience
- Fully guarded, anti-friction ball bearing ways
- Extra long table for greater work capacity
- Universal positioning of elevating hand wheel
- Four speed spindle drive
- Convenient one-shot lubrication system

ALLIS-CHALMERS

CASE

DEERE

INTERNATIONAL HARVESTER

G. LeTOURNEAU

MASSEY-HARRIS-FERGUSON

These features sound particularly outstanding

GALLMEYER & LIVINGSTON

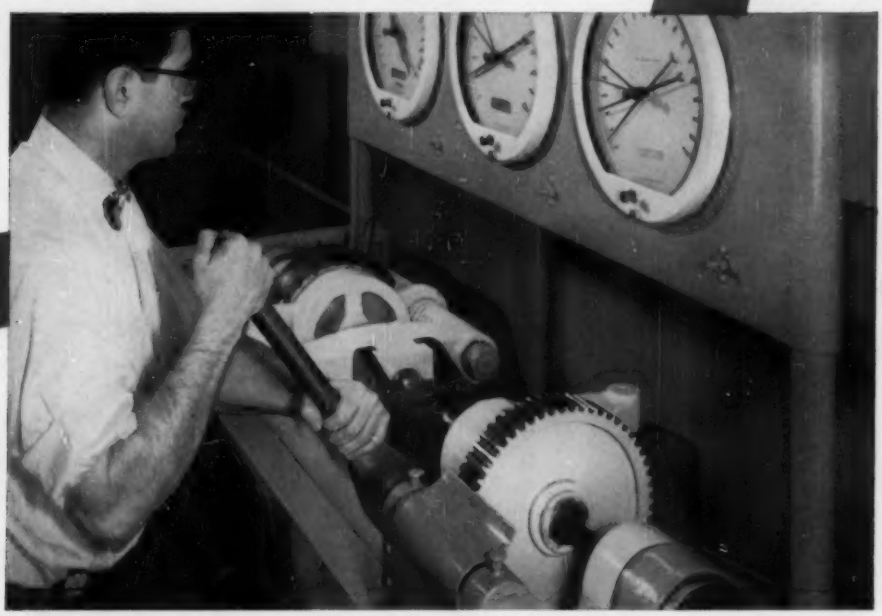
GALLMEYER & LIVINGSTON CO.
Grand Rapids, Michigan

Write for details GALLMEYER & LIVINGSTON CO., 430 Straight Ave., S.W., Grand Rapids, Michigan

TO PRODUCE QUALITY
SOCKET SCREWS THE H-K WAY—

OUR LABORATORY CONDUCTS EXHAUSTIVE PHYSICAL AND CHEMICAL TESTS WITH THE MOST MODERN EQUIPMENT

Conventional testing isn't enough . . . we subject H-K screws to rigid tests in our TEN-TOR *machine to determine resistance to both tensile and torque stresses. Because we test the finished screws and not just material, you can be sure every H-K Socket Screw will stand up under the toughest application.*

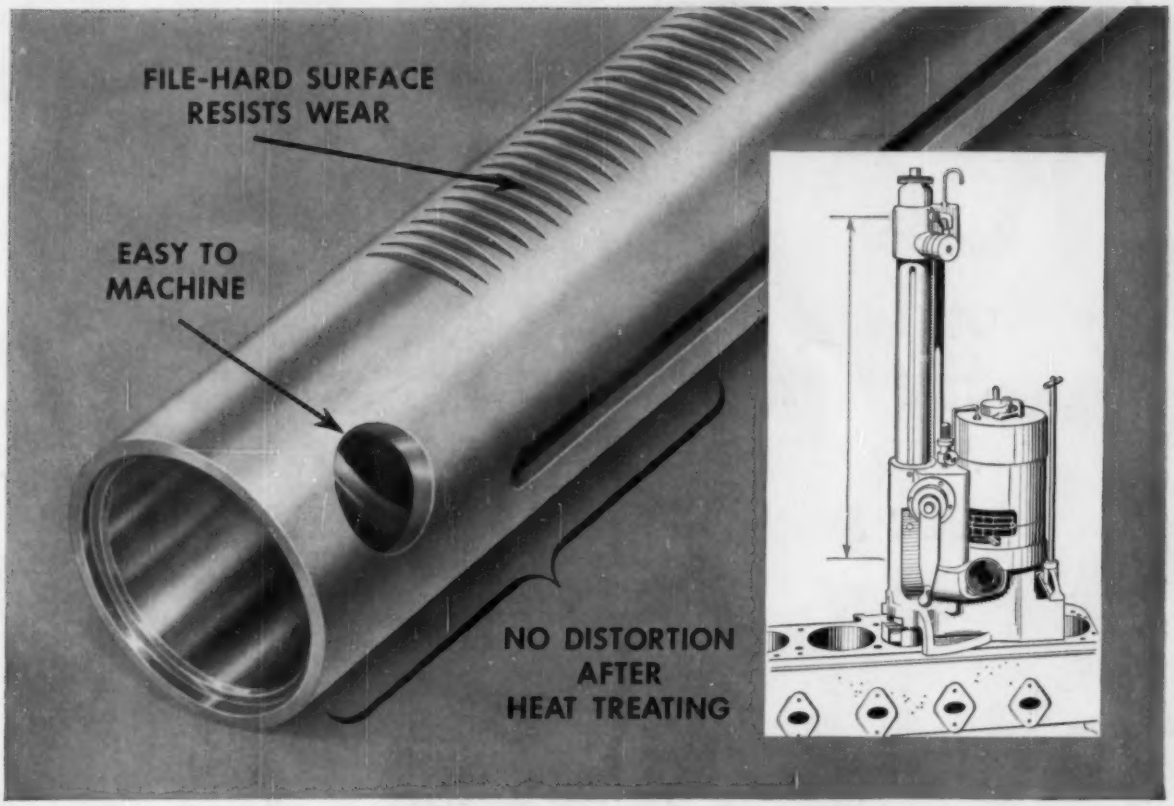


For the finest in socket screw products . . . for unmatched SAME-DAY SERVICE**—the name to remember is Holo-Krome. Write for free catalog and technical information.**

HOLO-KROME SOCKET SCREWS

THE HOLO-KROME SCREW CORPORATION • HARTFORD 10, CONN.

SOLD ONLY THROUGH AUTHORIZED H-K DISTRIBUTORS



Boring bar maker solves heat-treat distortion problem by switching to TIMKEN® 52100 steel

HEAT-TREATING distortion was running up the manufacturing costs of the boring bars Van Norman Automotive Equipment Company makes for reboring hard-sleeve cylinder blocks. The column of the boring bar, which acts as the spindle, had to be extremely straight. Yet many of them were distorting after heat treatment. And that meant putting them through an extra straightening process.

Studying the problem, metallurgists of the Timken Company suggested a switch to Timken® 52100 steel. Since this steel is hard and tough, it had the qualities Van Norman wanted. And because it responds uniformly to heat treatment it proved to be the answer to their production problem.

By switching to Timken 52100 steel, Van Norman eliminated the need for the costly straightening operation. And as a bonus, they've found that Timken 52100 steel is easier to machine than the steel they previously used.

The Timken Company pioneered the development of 52100 and is one of the principal producers of the steel—the only source of the grade in three finished forms: bars, tubing and wire. You can rely on the Timken Company for small run or emergency requirements as well as mill quantities.

We stock 101 sizes of 52100 steel tubing, ranging from 1″ to 10½″ O.D. For a complete stock list of available sizes, grades and finishes, write The Timken Roller Bearing Company, Canton 6, Ohio. Cable: "TIMROSCO".

TIMKEN *Fine Alloy* **STEEL**

TRADE-MARK REG. U.S. PAT. OFF.

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING